It's Easy To Order Another Copy!

Just dial 1-800-999-6779. Toll free (in the United States and Canada). All other areas please dial 301-725-7937.

Ask for *Data for Food Demand Analysis: Availability, Characteristics, Options (AER-613)*.

The cost is $8.00 per copy. For non-U.S. addresses (including Canada), add 25 percent. Charge your purchase to your VISA or MasterCard, or we can bill you. Or send a check or purchase order (made payable to ERS-NASS) to:

> ERS-NASS
> P.O. Box 1608
> Rockville, MD   20849-1608.

We'll fill your order by first-class mail.

Data for Food Demand Analysis: Availability, Characteristics, Options. By Alden C. Manchester, Commodity Economics Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 613.

Abstract

Demand analysts often devote less attention to selecting data series than econometric techniques, although data are equally important to the results. This report discusses the availability, characteristics, and derivation of time series for food consumption, food prices, food expenditures, and income for use in food demand analysis. It also shows how new series, which will provide consistent measures of quantity and price, can be constructed from available data.

Keywords: Data, demand analysis, food expenditures, incomes, prices, quantities.

Note: Use of company names in this publication is for identification only and does not imply endorsement by the U.S. Department of Agriculture.

Acknowledgments

List of Abbreviations

AFDC	Aid to Families with Dependent Children
BEA	Bureau of Economic Analysis, U.S. Department of Commerce
BLS	Bureau of Labor Statistics, U.S. Department of Labor
CES	Consumer Expenditure Survey
CCES	Continuing Consumer Expenditure Survey
CPI	Consumer Price Index
CPI-U	Consumer Price Index for all urban households
CPI-W	Consumer Price Index for wage earners
CPS	Current Population Survey
ERS	Economic Research Service, U.S. Department of Agriculture
FSIS	Food Safety and Inspection Service, U.S. Department of Agriculture
GNP	gross national product
HFCS	Household Food Consumption Survey
IFMA	Institutional Food Manufacturers Association
LNA	Leading National Advertisers
MRCA	Market Research Corporation of America
MSA	Metropolitan Statistical Area
NASS	National Agricultural Statistics Service, U.S. Department of Agriculture
NFCS	Nationwide Food Consumption Survey
NIPA's	National Income and Product Accounts
PPI	Producer Price Index
RTC	ready-to-cook
SIC	Standard Industrial Classification
SSI	Supplemental Security Income
TEFAP	Temporary Emergency Food Assistance Program
USDA	U.S. Department of Agriculture
WIC	Women, Infants, and Children nutrition program

Contents

Summary

Demand analysts often devote less attention to selecting data series than econometric techniques, although data are equally important to the results. This report discusses the availability, characteristics, and derivation of time series for food consumption, food prices, food expenditures, and income for use in demand analysis. It also shows how new series, which will provide consistent measures of quantity and price, can be constructed from available data.

Although demand analysis for food products is constrained by the availability of data, analysts have some latitude of choosing among the less-than-ideal series that are available. This report discusses what options are available among data series for quantity, price, food expenditures, and income. Analysts seeking data on food expenditures, for example, can choose among total food expenditures (from the U.S. Department of Agriculture, Economic Research Service), personal consumption expenditures (from the U.S. Department of Commerce, Bureau of Economic Analysis), and the Continuing Consumer Expenditure Survey (from the U.S. Department of Labor, Bureau of Labor Statistics). There are substantial differences among these series.

The closer the match between the quantity and price series, the better the analysis. Close matches often are not possible because of limits of available data, contributing to an attitude of some analysts that nothing can be done to improve the situation so any data series will do. But viable alternatives exist and need to be considered. This report gives examples.

A mismatch exists between commonly used price and quantity series, and this report discusses remedies. Bureau of Labor Statistics price data for commodities and commodity groups cover only food sold through retail stores, while Economic Research Service per capita consumption data include food sold through retail stores, food sold through restaurants, and other food uses. Using a case study of chicken, the report describes the mismatch between commonly used retail price and total quantity time series data and then shows that the problem can be alleviated by constructing better matched price and quantity series at the wholesale level.

Data for Food Demand Analysis
Availability, Characteristics, Options

Alden C. Manchester[*]

Introduction

Information is data endowed with relevance and purpose. Converting data into information thus requires knowledge. And knowledge, by definition, is specialized. (In fact, truly knowledgeable people tend toward over-specialization, whatever their field, precisely because there is always so much more to know.)—Peter Drucker

Demand analysts often devote less attention to selecting data series than to the choice of econometric techniques, although data are equally important to the results. This report discusses the availability, characteristics, and derivation of time series for food consumption, food prices, food expenditures, and income for use in food demand analysis. It also shows how new series, which will provide consistent measures of quantity and price, can be constructed from available data.

Although demand analysis for food products is constrained severely by the availability of data, analysts do have some latitude in choosing among the less-than-ideal series that are available. This report— which aims to persuade demand analysts to give equal attention to selection of data and methods— discusses major alternative data series that are available, their characteristics, and their limits. It also explores options for constructing new series that might come closer to meeting the needs of the analysis.

Food expenditure series are explained, followed by discussions of price, quantity, population, and income measures. Advertising and promotion are addressed because they induce changes in consumer behavior that influence demand. The report concludes with a case study that provides an application of several of the options available to the analyst in constructing more suitable time series.

Overview

Food demand analyses are either time series or cross-section analyses. Time series analysis typically uses data on quantities, product prices, and income, while cross-section analysis typically includes data from individual households such as prices, quantities (or expenditures), income, and demographic characteristics. This report discusses data problems in time series analysis of annual U.S. food consumption data.

Major advances in econometric techniques in the last four decades led analysts to focus attention on techniques. But to use the techniques, analysts must have data and make choices. Analysts need to understand what a particular series is supposed to represent and how it is constructed if they are to make informed choices. Most importantly, analysts need to know what data are available and how data can be adapted to develop a measure tailored to their particular analysis.

What guidance on data selection do analysts get from theory? Neoclassical theory applies to an individual at a given time with fixed preferences and perfect information. In this setting, the theory yields a model which asserts that the individual maximizes utility by choosing a set of products in view of known prices of all products and income (Capps and Havlicek, 1987). [1]

But the assumptions of neoclassical theory are so far from reality that modifications have been proposed by a number of analysts to overcome some of the limitations. Generally speaking, the analyst is interested in aggregate behavior, not individual behavior. The analyst wants to know what is happening in the market and why. The "why" includes analysis of the vector of determinants other than price and income that determine the consumption level of a given commodity, including socioeconomic, demographic, and other factors. A single-period model is relevant in a cross-section analysis, but a time series model must be dynamic.

[*]Alden C. Manchester is senior economist, Office of the Director, Commodity Economics Division, Economic Research Service, U.S. Department of Agriculture.

[1]References, denoted by last name of author and date of publication, are listed in the References section at the end of this report.

The theory tells the analyst that he or she needs data on prices, incomes, and the many factors that change consumer choices. It offers no guidance on which data series should be selected.

Food Expenditures

Major food expenditure time series differ in coverage (which items are included and which are excluded), data sources, and methods. The analyst needs to understand the differences to make an informed choice.

Three time series on food expenditures are available:

* Total expenditures, available from the U.S. Department of Agriculture's Economic Research Service (ERS). It gives annual data reaching back to 1889.

* Personal consumption expenditures, available from the U.S. Department of Commerce's Bureau of Economic Analysis (BEA). Data from 1929 on are available.

* Continuing Consumer Expenditure Survey (CCES), available from the U.S. Department of Labor's Bureau of Labor Statistics (BLS). Survey data have been available since 1980. [2]

Total expenditures (ERS series) covers all human food, both purchased (with money or food stamps) and in-kind (donated, home-produced, and sport fish and game). Purchases include those paid for by families and individuals; travel and entertainment paid for by businesses; and food furnished to employees (in military messhalls, restaurants, and institutions), to inmates of prisons, to patients of hospitals and nursing homes, and to residents of other institutions. By excluding portions of food expenditures not paid for by families and individuals, a series is obtained that measures food expenditures paid out of personal income.

Personal consumption expenditures (BEA series) for food includes expenditures paid out of personal income for human food, pet food, animal feed (mostly for personally owned horses), and ice. Because personal income includes food stamps and food produced and consumed on the same farm, these items are included.

The CCES (BLS) includes only human food purchased by families and individuals with money or food stamps. Home production, donations, and gifts are excluded.

The CCES excludes military families, which the other two measures include.

Total Expenditures

ERS' series on total food expenditures includes all expenditures, both money and in-kind, for food in the United States (table 1). This series is published in *Food Consumption, Prices, and Expenditures,* a statistical bulletin published annually by ERS.[3] Of the series discussed in this report, its coverage is broadest. In most demand analyses, desired coverage is somewhat less comprehensive.

Income is viewed as a major constraint on expenditures in most analyses. Thus, the analyst would prefer a food expenditure series that limits its coverage to categories that are also reflected in income. Table 2 presents such a series. Foods purchased with food stamps are included because food stamps are counted in personal income. Farm home-produced food is included (though at farm prices), but nonfarm home-produced food, sport fish, and game are excluded. The other major category excluded is meals and snacks not paid for by the family or individual, such as expense account meals and food furnished to prisoners. Food expenditures paid out of personal income ranged from 84-88 percent of total expenditures since 1960.

Another food expenditures series (table 3) comes closer to what families and individuals spend out of money income, but it does not match up as well with personal income. It excludes from off-premise expenditures food purchased with food stamps and farm home-produced food. Food furnished to employees (military and civilian) is excluded from meals and snacks. This food expenditure series, however, adds back in the share of food served in hospitals and nursing homes that is paid for by the patient, either in cash or through the patient's share of health insurance.

Table 4 compares the coverage of all three versions of the ERS food expenditure time series, detailing those items included in total expenditures but excluded from food expenditures paid out of personal income or personal money income.

Personal Consumption Expenditures

Personal consumption expenditures is a component of the National Income and Product Accounts (NIPA's) compiled by the BEA. Its greatest attraction to the

---

[2]Manchester, 1987, provides an indepth discussion of the differences between these series.

[3]Updates of total food expenditures are available on request to Alden Manchester. Manchester, 1987, discusses the development and methodology of total food expenditures.

analyst is the fact that personal consumption expenditures for food is nestled in a set of components including consumer expenditures for all other goods and services, income, and savings. Some of its conventions, however, are not necessarily those the user might assume, as will be shown later in the discussion of personal income.

Personal consumption expenditures is a base-year-and-mover series. Using the most recent base year, currently 1977, quarterly estimates are constructed using selected movers, such as retail food store sales, to estimate food for off-premise use. The percentage change in the "mover" series from the base year is multiplied by the base-year value of the series being estimated.

The base year is derived by the BEA from the input-output analysis in each year of the U.S. Department of Commerce, Bureau of the Census' economic censuses, taken roughly every 5 years. BEA's input-output analysis is an application of the commodity-flow method. The flows of commodities through the system are followed from farm to manufacturer and then through transportation, wholesaling, retailing, and food service, with appropriate margins added at each level. BEA's input-output transactions table starts with the value of production, primarily at the manufacturing level, and distributes food sales among the following uses:

• Food sold to other manufacturing industries.

• Food produced and consumed on farms.

Table 1—Total expenditures for food

Year	Food for off-premise use			Meals and snacks			All food
	Sales	Food produced at home, donated	Total	Sales	Supplied, donated	Total	
				Million dollars			
1929	15,319	4,558	19,877	3,496	625	4,121	23,998
1939	11,853	3,331	15,184	2,977	636	3,613	18,797
1949	31,715	5,896	37,611	9,752	2,250	12,002	49,613
1960	49,424	4,697	54,121	16,191	3,416	19,607	73,728
1961	50,020	4,591	54,611	16,861	3,524	20,385	74,996
1962	51,052	4,353	55,405	17,939	3,656	21,595	77,000
1963	51,495	3,980	55,475	18,850	3,707	22,557	78,032
1964	53,729	3,988	57,717	20,457	3,865	24,322	82,039
1965	56,602	3,940	60,542	22,115	4,082	26,197	86,739
1966	59,090	3,815	62,905	24,161	4,540	28,701	91,606
1967	59,544	3,659	63,203	25,540	4,879	30,419	93,622
1968	62,816	3,707	66,523	28,326	5,134	33,460	99,983
1969	67,249	3,849	71,098	30,561	5,554	36,115	107,213
1970	73,441	4,086	77,527	33,777	5,806	39,583	117,110
1971	77,366	4,080	81,446	36,096	6,155	42,251	123,697
1972	83,636	4,297	87,933	40,440	6,147	46,587	134,520
1973	92,069	5,217	97,286	45,162	7,488	52,650	149,936
1974	104,138	6,114	110,252	48,924	9,121	58,045	168,297
1975	113,875	5,975	119,850	57,848	10,261	68,109	187,959
1976	121,686	6,149	127,835	65,638	11,195	76,833	204,668
1977	130,524	6,035	136,559	72,887	12,062	84,949	221,508
1978	143,879	6,476	150,355	82,333	13,848	96,181	246,536
1979	160,491	6,992	167,483	94,009	15,298	109,307	276,790
1980	177,363	8,275	185,638	103,298	17,232	120,530	306,168
1981	189,240	9,280	198,520	113,240	18,323	131,563	330,083
1982	196,771	9,435	206,206	121,730	18,988	140,718	346,924
1983	207,158	9,935	217,093	131,773	19,901	151,674	368,769
1984	219,046	9,324	228,370	140,637	21,200	161,837	390,207
1985	229,549	7,079	236,628	148,306	21,818	170,124	406,752
1986	237,043	7,698	244,761	158,227	23,144	181,371	426,132
1987	244,943	8,412	253,355	174,175	24,470	198,645	452,000
1988	255,669	8,360	264,029	186,765	25,734	212,499	476,528

- Food purchased for off-premise consumption.

- Meals and snacks purchased with personal funds.

- Meals purchased with business funds.

- Food supplied to employees.

- Food purchased for entertainment and gifts.

- Food used by others (airlines, hospitals, institutions, and so forth).

The value added by transportation, wholesale, and retail trade is estimated separately and added to the value of food at the manufacturer level.[4]

[4]For further discussion of the input-output analysis and comparisons with total expenditures, see Manchester, 1987.

Current estimates are constrained by the requirement that the two sides of the NIPA balance. The changes in the components of personal consumption and changes in their movers were similar between 1977 and 1986 (table 5). For example, personal consumption expenditures for food purchased for off-premise use increased 84.7 percent and retail sales of food stores increased 87.2 percent. The constraints of national income accounting apparently had minimal effect in that period.

Some idea of how good the mover is can be derived from a look at estimated food expenditures before and after rebasing with a newly completed input-output analysis. The 1977 estimates were revised 0.9 percent for off-premise food and 4.9 percent for purchased meals.

Table 2—Food expenditures by families and individuals paid out of personal income

| Year | Expenditures for food | | | Proportion of total food expenditures |
	Off-premise	Meals and snacks	Total	
	-------- Million dollars --------			Percent
1929	16,918	2,617	19,535	81.4
1939	12,952	2,289	15,241	81.1
1949	33,774	7,775	41,549	83.7
1960	50,558	12,562	63,120	85.6
1961	51,069	13,100	64,169	85.6
1962	51,996	13,897	65,893	85.6
1963	52,374	14,546	66,920	85.8
1964	54,530	15,685	70,215	85.6
1965	57,382	16,946	74,328	85.7
1966	59,884	18,636	78,520	85.7
1967	60,254	19,776	80,030	85.5
1968	63,510	21,723	85,233	85.2
1969	67,956	23,362	91,318	85.2
1970	74,166	25,845	100,011	85.0
1971	78,074	26,922	104,996	84.9
1972	84,441	30,134	114,575	85.2
1973	93,133	33,483	126,616	84.4
1974	105,374	37,059	142,433	84.6
1975	115,087	44,056	159,143	84.7
1976	122,949	50,415	173,364	84.7
1977	131,616	56,138	187,754	84.8
1978	144,991	63,881	208,872	84.7
1979	161,674	73,669	235,343	85.0
1980	178,421	82,205	260,575	85.1
1981	190,284	90,177	280,428	85.0
1982	197,736	98,583	296,277	85.4
1983	208,171	108,377	316,548	85.8
1984	220,064	117,789	338,853	86.6
1985	230,566	126,365	356,931	87.8
1986	237,931	132,218	370,149	86.7
1987	245,797	145,317	391,114	86.5
1988	255,100	155,913	411,013	86.3

Table 3—Food expenditures by families and individuals paid out of personal money income

| Year | Expenditures for food | | | Proportion of total food expenditures |
	Off-premise	Meals and snacks	Total	
	-------- Million dollars --------			Percent
1929	15,319	2,724	18,043	75.2
1939	11,844	2,463	14,307	76.1
1949	31,715	7,508	39,223	79.1
1960	49,424	11,834	61,258	83.1
1961	50,006	12,300	62,306	83.1
1962	51,038	13,051	64,089	83.2
1963	51,399	13,707	65,106	83.4
1964	53,701	14,839	68,540	83.5
1965	56,557	15,977	72,534	83.6
1966	59,007	17,387	76,394	83.4
1967	59,405	18,279	77,684	83.0
1968	62,453	20,215	82,668	82.7
1969	66,749	21,819	88,568	82.6
1970	72,338	24,329	96,667	82.5
1971	75,667	25,507	101,174	81.8
1972	80,575	28,761	109,336	81.3
1973	90,988	32,102	123,090	82.1
1974	103,807	35,190	138,997	82.6
1975	110,094	41,753	151,847	80.8
1976	117,009	47,688	164,697	80.5
1977	125,885	53,370	179,255	80.9
1978	138,983	60,734	199,717	81.0
1979	153,853	69,976	223,829	80.9
1980	168,712	77,742	246,454	80.5
1981	178,883	85,319	264,235	80.0
1982	185,789	93,477	279,266	80.5
1983	195,151	102,987	298,138	80.8
1984	207,620	111,636	319,256	81.8
1985	218,481	119,156	337,637	83.0
1986	225,928	125,554	351,482	82.5
1987	233,647	137,652	371,299	82.1
1988	243,026	147,707	390,733	82.0

Table 4—Coverage of ERS food expenditures in tables 1, 2, and 3

Category	Total expenditures (table 1)	Expenditures paid out of personal income (table 2)	Expenditures paid out of personal money income (table 3)
Off-premise food:			
Cash purchases	Included	Included	Included
Food stamps	Included	Included	Excluded
Donated	Included	Excluded	Excluded
Home produced:			
Farm	Included at retail prices	Included at farm prices	Excluded
Nonfarm	Included	Excluded	Excluded
Sport fish and game	Included	Excluded	Excluded
Meals and snacks:			
Purchased by families and individuals	Included	Included	Included
Expense account meals	Included	Excluded	Excluded
Food furnished to:			
Employees	Included	Included	Excluded
Patients and inmates	Included	Excluded	Partly excluded[1]
Food and cash donated to schools and institutions	Included	Excluded	Excluded

[1]Excludes the share of meals served in hospitals and nursing homes that was paid for by government, business, and philanthropy.

The category termed "food" in both input-output analyses and personal consumption expenditures must be adjusted by removing items that are not human food to obtain a measure comparable to that in total expenditures. This step involves separating out pet food, animal feed (primarily for horses), and ice (in 1972-77) from "food." These items constituted 3.2 percent of personal consumption expenditures for off-premise food in 1986, up from 1.6 percent in 1967.

The estimates in personal consumption expenditures and total expenditures differ significantly. The estimates for off-premise use differ because of differences in methods, while those for meals and snacks are conceptually different.

Table 5—Personal consumption expenditures for food and retail store sales, 1977 and 1986

Item	1977	1986	Percentage increase, 1977-86
	Billion dollars		Percent
Personal consumption expenditures (including sales taxes):			
Food purchased for off-premise use	160.6	296.6	84.7
Purchased meals and snacks	56.2	131.1	133.3
Retail sales (including sales taxes):			
Food stores	161.6	302.6	87.2
Eating places	58.1	140.3	141.6
Eating and drinking places	66.0	152.4	130.8

Food purchased for off-premise use is essentially the same concept in both series if home food production and donations are excluded from total expenditures and if estimated expenditures for pet food are excluded from personal consumption expenditures. After those adjustments, the estimate from total expenditures was 93 percent of that from personal consumption expenditures in 1954, 82 percent in 1967, 84 percent in 1977, and 82 percent in 1982.

Regarding outlays for meals and snacks, significant conceptual differences exist between personal consumption expenditures and total expenditures. The reason is that total expenditures include business expenditures and expenditures for food served in hospitals and institutions, whereas personal consumption expenditures exclude these items. The modified series shown in table 2 is conceptually similar to personal consumption expenditures and its data sources are comparable.

Consumer Surveys

Until recently, USDA conducted a Nationwide Food Consumption Survey (NFCS), formerly called the Household Food Consumption Survey (HFCS), and the Bureau of Labor Statistics carried out a Consumer Expenditure Survey (CES) each about once a decade. Each survey provided measures of food expenditures by the population living in households, but neither was conducted to provide data for demand analysis.

Neither provided an estimate of expenditures for food eaten at home. CES provided no figures for the value of food not purchased (for example, Government-donated food, food received as a gift, or home-produced food), but it included expenditures for food prepared at home and eaten elsewhere (for example, lunches carried to work or school, meals consumed at picnics, and food given to others). Carryout foods are treated differently in the two surveys.

Survey methods are not the same, although both are based on national probability samples. Research comparing various survey methods shows the differences arising from methods, but gives no indication of the true values (Levine and Miller, 1957; Sudman and Ferber, 1971 and 1974; Burk and Pao, 1976).

CES became a continuing survey in 1980 and its name was changed to Continuing Consumer Expenditure Survey (CCES). But it covered only urban areas in 1981-83. There is a drive to make NFCS a continuing survey, but until recently its coverage was limited by budget problems and its emphasis was on individual food intake rather than on household consumption and expenditures. In 1987-88, a household survey was conducted, although with a limited sample size.

The HFCS yielded estimates 21 percent higher than total expenditures for off-premise food in 1955 and 10 percent higher in 1965-66. The two-part CES consists of an interview and a diary; CES interview results were close to the total expenditures series estimates in 1960-61 and in 1972-73. All the survey-derived figures for meals and snacks are lower than those from total expenditures because only total expenditures include business expenditures. HFCS figures are also higher than CES figures for meals and snacks.

The 1977-78 NFCS was the first USDA survey to obtain data from nonhousekeeping households, those with no member who consumed 10 or more meals from home food supplies during the survey week. Unpublished tabulations for this small segment, 6 percent of households and 3.5 percent of persons, allow the analyst to better estimate the level of aggregate food expenditures that is indicated by the survey. Nonhousekeeping households accounted for 2.7 percent of total expenditures for off-premise food and 13.1 percent of meals and snacks.

CES results and personal consumption expenditures, compared category by category, reveal overall patterns. Raymond Gieseman of BLS compared CES results with personal consumption expenditures for all categories that could be made approximately comparable. The urban-only CES figures for October 1981-83 were adjusted to U.S. figures using 1980-81 rural-urban relationships. CES interview survey results were lower than personal consumption expenditures for almost all categories (table 6).

Comparing estimates of off-premise expenditures, estimates of personal consumption expenditures rose each year from 1980 to 1984, while the CCES results fluctuated. In fact, 1980 and 1983 CCES estimates were identical. Even if the 1981-83 adjusted figures are ignored, the increase in CCES estimates from 1980 to 1984 was only 6.6 percent. Meals and snacks rose faster according to survey figures than according to personal consumption expenditure figures.

Figures on food expenditures from the diary segment of the CCES are lower than figures from the interview segment of the CCES, but they track better with personal consumption expenditures (table 7). Much of the change in the estimates for off-premise food, as reported in the interview portion of the survey, was due to rewording of interview questions on shopping and purchase patterns at grocery, convenience, and specialty food stores.

The movement of the estimates for meals and snacks reported by CCES over the 5-year period 1980-84 closely matches the movement for total expenditures over the same period. However, survey figures come in at a lower level, as expected, because they exclude business expenses for travel and entertainment (table 8).

Over the entire period, estimates of off-premise food based on the CCES interview survey averaged nearly the same as estimates of total expenditures, but the trend is all wrong. Estimates from the diary survey are low compared with estimates of total expenditures, but their movements are similar.

Carryout Food

The NFCS and the total expenditures series differ in handling of (1) carryout foods from eating places that are taken home and eaten and (2) candy, soft drinks, and snacks purchased in stores and not taken home to be eaten.[5] An idea of the approximate magnitude of these two categories can be obtained from the 1977-78 NFCS and the 1977 census.

---

[5] A similar point was made by Pearl, 1979, when comparing the CES and personal consumption expenditures, but it appears not to apply to carryout food in the CES.

Carryout foods brought home totaled about $700 million in the 1977-78 NFCS:

	Million dollars
Fried chicken	304
Pizza	209
Hamburger, hot dogs, barbecue, French fries, and so forth	96
Submarines, tacos, and so forth	73
Chinese food	15
Total	697

Takeout sales of eating places totaled $9,574 million in the 1977 census. Most of those sales were from fast food places. In addition, NFCS results include some foods, such as refrigerated pizzas to be cooked and barbecued chickens bought from grocery stores rather than fast food places. These two sets of data imply that about 7 percent of takeout sales were carried home from the point of purchase.

Large quantities of food are purchased at food stores and consumed outside the home. The major items are candy, gum, soft drinks, chips, and pretzels. The NFCS reported that, in 1977-78, $7,090 million worth of these items were consumed at home, leaving about $7,400 million of these snack items bought at food stores and consumed away from home. The effect of the adjustments shown below is to move the survey results further away from the total expenditures and personal consumption expenditures figures:

Table 6—Comparison of aggregate expenditures from the Continuing Consumer Expenditure Survey (CCES) (interview segment) with personal consumption expenditures, 1980-84

Expenditure category	Interview survey aggregate expenditure					Ratio of interview survey aggregate to personal consumption expenditures				
	1980	1981	1982	1983	1984	1980	1981	1982	1983	1984
	---------- Billion dollars ----------					------------- Ratio -------------				
Food	253.7	266.2	256.9	274.1	293.2	0.85	0.83	0.75	0.76	0.75
Off-premise food	194.9	202.2	186.3	194.9	207.8	.91	.87	.76	.76	.75
Meals and snacks	58.8	64.0	70.6	79.3	85.5	.70	.72	.74	.76	.75
Alcoholic beverages	21.5	22.3	23.0	24.0	25.6	.47	.46	.46	.46	.48
Rent, fuel, and utilities[1]	141.1	162.5	180.4	193.2	218.1	.89	.91	.92	.91	.96
Telephone	25.9	29.3	31.2	35.5	39.3	.93	.94	.88	.94	.99
Household operations[2]	10.7	10.7	12.1	13.2	16.2	.68	.63	.71	.74	.79
House furnishings and equipment	55.1	55.5	56.9	65.3	74.3	.68	.64	.64	.67	.69
Household textiles	5.1	5.4	6.0	6.7	7.3	.51	.50	.53	.54	.55
Furniture	19.8	19.0	18.3	22.1	24.8	.95	.86	.85	.93	.93
Floor coverings	4.3	4.1	4.4	4.6	5.8	.63	.58	.62	.55	.61
Major and minor appliances	12.6	13.3	13.0	13.2	15.4	.77	.76	.73	.67	.71
Housewares	2.4	2.7	2.7	3.0	3.1	.26	.27	.26	.27	.25
Miscellaneous household equipment	10.8	11.0	12.4	15.8	17.9	.60	.56	.61	.72	.75
Apparel	69.9	77.4	79.4	90.8	100.5	.53	.53	.53	.55	.56
Transportation	222.0	232.9	235.8	274.3	300.1	.97	.93	.92	.97	.95
Private transportation[3]	207.5	215.8	219.6	256.8	278.2	1.00	.94	.94	.99	.96
Public transportation	14.6	17.0	16.2	17.5	21.9	.70	.76	.71	.75	.84
Entertainment	58.0	65.9	68.6	77.2	86.1	.65	.65	.63	.64	.65
Fees and admissions	17.9	20.3	20.8	24.8	28.3	.65	.63	.60	.66	.71
Radio, TV, and sound equipment	16.3	19.2	22.5	24.6	28.0	.65	.68	.70	.66	.66
Other entertainment	23.9	26.3	25.3	27.8	29.7	.64	.65	.60	.62	.59
Personal care services	11.4	12.4	13.2	14.8	16.9	1.06	1.09	1.12	1.06	1.18
Reading materials	10.7	11.5	12.1	13.6	15.1	.67	.67	.67	.71	.73
Tobacco	14.4	15.0	16.9	19.3	20.5	.69	.66	.69	.69	.68
Miscellaneous[4]	10.2	12.2	13.1	15.4	16.2	.42	.42	.39	.40	.38

[1]Includes rent for tenant-occupied dwelling units, lodging away from home and at school, and utility costs of homeowners and renters. [2]CCES amounts for babysitting, day care centers, care of invalid or elderly, and household laundry and cleaning were deleted from comparison. [3]PCE concept of dealer margin as the value of used vehicles was approximated in the CCES. Excluded were amounts for vehicle insurance; finance charges; and license, registration, and inspection fees. [4]Includes bank service charges and safe deposit box rental, legal and accounting fees, and funeral and burial expenses. Note: CCES aggregate expenditure for the total population for 1981 through 1983 are special constructions for this comparison. CCES data were collected only for the urban population in those years.

Source: Gieseman, 1987.

	Off-premise food	Meals and snacks
	Million dollars	
Reported in NFCS	151,035	57,994
Carryout food taken home	- 697	+ 697
Snacks from stores	+ 7,400	-7,400
Adjusted to total expenditures concept	157,738	151,291
	Percent	
Percentage of total expenditures	113.5	68.4

Survey Methodology

The methodology used in a survey has a pronounced effect on the resulting estimates of food expenditures. The 1960-61 CES food expenditure data, for example, were collected by a 7-day recall questionnaire, while data for all other categories were collected by interviewer-administered annual recall methods.

Current procedures were adopted in the 1972-73 CES. They consist of quarterly interviews for "global" items and two weekly diaries each quarter for frequently purchased items. The diaries are obtained from another sample. Both segments include food.

For expenditures on off-premise food, interview survey respondents are asked a global question; that is, to estimate the number of trips they made to the grocery store for the prior 3-month period, the average expenditures per trip, and the amount spent for nonfood items (which is then subtracted from the total). Food expenditures at specialty and convenience stores are then added to give an estimate of total off-premise food. Diary survey respondents keep an itemized record of daily expenditures on food and other items. Estimates of expenditures for off-premise food, obtained from the interview survey, were about 22-23 percent higher than the diary survey estimates in both 1980 and 1981.

The opposite result was obtained for expenditures for meals and snacks. Outlays for these food items are also collected in the interview survey by a global question. Interview survey statistics on expenditures for meals and snacks (including money spent on these items during trips) were about 4 percent lower than the diary survey estimates in 1980. The interview survey statistics for meals and snacks were about 5 percent lower than the diary survey estimates in 1981. Expen-

Table 7—Estimated aggregate expenditures for off-premise food categories, Consumer Expenditure Survey (CES) (diary segment) compared with personal consumption expenditures measure, 1980-84

Food category	CES (diary segment) aggregate expenditures					Ratio of CES (diary segment) aggregate to personal consumption expenditures				
	1980	1981	1982	1983	1984	1980	1981	1982	1983	1984
	———————— *Billion dollars* ————————					———————— *Ratio* ————————				
Total food	222.74	242.52	263.90	268.39	280.93	0.75	0.76	0.77	0.74	0.72
Off-premise food	146.10	158.40	166.56	166.57	173.06	.69	.68	.68	.64	.63
Cereals and cereal products	6.05	6.87	7.57	7.14	7.49	.85	.87	.98	.93	.92
Bakery products	12.63	13.48	15.07	14.60	15.94	.74	.73	.74	.73	.76
Meat	43.51	44.87	45.13	43.67	42.93	.69	.66	.63	.57	.51
Fish and seafood	4.17	4.63	4.78	5.27	5.85	.48	.49	.50	.51	.52
Eggs	2.76	3.15	3.23	3.03	3.17	.64	.69	.65	.59	.57
Fresh milk and cream	10.31	11.35	11.96	11.18	11.35	.70	.74	.70	.63	.61
Other dairy products	9.21	10.12	11.13	11.15	11.26	.74	.78	.77	.75	.71
Fresh fruits and vegetables	12.46	14.77	15.88	15.82	16.56	.47	.51	.52	.50	.48
Processed fruits and vegetables	9.04	10.03	10.65	10.68	11.48	.32	.33	.33	.32	.31
Sugar and other sweets	5.57	5.72	5.81	6.16	6.61	.64	.56	.55	.57	.59
Fats and oils	4.25	4.73	4.74	4.50	4.95	.68	.66	.63	.58	.60
Nonalcoholic beverages	13.42	13.93	14.23	14.90	15.92	2.15	1.92	1.89	1.92	1.96
Miscellaneous prepared foods	12.72	14.75	16.36	16.93	19.55	1.28	1.27	1.35	1.36	1.52
Meals and snacks[1]	76.64	84.12	97.34	103.36	107.87	.92	.94	1.02	.99	.95

[1]Includes expenditures for food purchased on trips. This information is collected in the interview segment.

Source: Gieseman, 1987.

ditures for food purchased on trips, reported in the interview survey but not in the diary survey, accounted for about 17 percent of total expenditures for meals and snacks in the interview survey in both 1980 and 1981.

When BLS integrates the results of the two segments—to obtain weights for the Consumer Price Index (CPI), for instance—it uses diary estimates both for food for off-premise use and for meals and snacks. It then adds in food purchased on trips and vacations obtained from the interview segment.

CES diary respondents keep separate diaries, one for each of 2 weeks. The diary for the second week almost always shows substantially smaller food expenditures than the diary for the first week. Among diarists who kept records for both weeks, first-week figures were 6.7 percent higher than second-week figures in 1972-73. In 1980-81, first-week figures were 8.4 percent higher. Three to 4 percent of the sample that dropped out after the first week had lower food expenditures than the 2-week participants. Within the week, reported food expenditures declined from day to day.

The phenomenon of overreporting in the first week is well known in diary surveys (Sudman and Ferber, 1971). The first week's diary, in continuing diary panels such as those conducted by Michigan State University and the University of Georgia, was routinely discarded because it overreported expenditures compared with any later period. In some cases, diarists continued to report for several years.

The 1960-61 CES was a one-time survey covering the entire calendar year for most categories of expenditures, supplemented by a 1-week recall for

detailed food expenditures and a few other small items.

The NFCS/HFCS uses an aided-recall procedure. Data on food used in a surveyed household were collected in an interview. The interviewee was the person identified as most responsible for the household's food planning and preparation. Trained interviewers, who used an aided-recall questionnaire, recorded the kind (such as ground beef or skim milk), the form (such as fresh, commercially canned, or frozen), the quantity, and the cost, if purchased, of each food or beverage used in the household during the 7 days before the interview.

Methodology used to obtain household food consumption data in the 1965-66 and 1977-78 NFCS's was the same, with a few exceptions. Households in the 1965-66 survey were interviewed at the initial contact. Households in the 1977-78 survey were contacted at least 7 days before the interview and asked to keep grocery receipts, shopping lists, menus, package labels, or other aids to help them recall the food used in the 7-day period. Both surveys measured food consumption at the level at which foods came into the kitchen.

NFCS's methodology change in 1977-78 resulted from a contract study by Response Analysis for USDA's Consumer and Food Economics Institute. Eight different methods of collecting household food use data were compared. Average expenditures per person were compiled for 11 of the total food groups. They ranged from 73-125 percent of the average for six methods (Response Analysis, 1976).

Table 8—Results of Continuing Consumer Expenditure Survey (CCES) compared with total expenditures

Item	CCES as percentage of total expenditures				
	1980	1981	1982	1983	1984
	Percent				
Interview survey:					
Off-premise food	109.7	106.6	94.7[1]	94.7	95.7
Meals and snacks	56.5	56.1	57.6	58.8	58.4
Diary survey:					
Off-premise food	82.2	83.5	84.6	80.9	79.7
Meals and snacks[2]	73.7	73.8	79.4	76.6	73.7

[1]Much of the 1981-82 decline is due to rewording of questions in the interview segment.

[2]Includes food purchased on trips, an item obtained from the interview segment.

Method	Percentage of average of six methods
(1) 7-day recall, no notes	124.5
(2) 7-day recall, casual notes	107.1
(3) 7-day recall, detailed notes	101.2
(4) 3-day recall, notes, daily phone call	94.6
(5) 3-day diary	87.6
(6) 7-day diary	73.4

Method 2 was used in 1977-78. Method 1 was used in 1965-66.

Consumption of alcoholic beverages is substantially underreported in all surveys, probably due to social forces that oppose alcohol use.

Problems in Estimating

Two major problems that can significantly affect time series estimates of food expenditures hinge on assumptions in the construction of the series. The first problem is that while the concept of sales of food for off-premise use is virtually identical in personal consumption expenditures and total expenditures, the estimates differ widely. The second is deciding how much of restaurant and hotel sales of meals should be attributed to personal expenditures and how much to business travel and entertainment.

Estimates of food sales for off-premise use contained in personal consumption expenditures and total expen-

ditures differed by about 20 percent in recent years. It would appear that estimates of personal consumption expenditures are strongly influenced by the use of Census Merchandise Line Sales for food, whose results are out of step with what food retailing developments of the past quarter century tell us. The census figure of 85 percent for food's share of grocery store sales did not change significantly between 1963 and 1977, remaining approximately the same as in 1948 (table 9). Yet this was the period when supermarkets revolutionized food marketing:

- Supermarket sales rose from 23 percent of grocery store sales in 1948, to 60 percent in 1963, and then to 75 percent in 1977 (table 10).

- Supermarkets added many nonfood lines to their merchandise so that food now constitutes a smaller percentage of their sales than it did 25 years ago.

Table 9—Food's share of grocery store sales

Year	Food		Alcoholic beverages		Grocery nonfoods[1]		Other nonfoods[2]	
	Census	Supermarket Business[3]	Census	Supermarket Business[3]	Census	Supermarket Business[3]	Census	Supermarket Business[3]
					Percent			
1963	84.5	76.5	1.5	4.9	6.7[4]	10.6	7.3	8.0
1967	85.0	73.4	1.7	4.9	6.1[4]	10.4	7.2	11.3
1972	84.9	73.0	2.1	5.4	6.5[4]	12.2	6.5	9.4
1977	84.9	72.6	2.5	5.1	7.0	12.6	5.6	9.7
1982	78.2	71.6	3.3	5.5	10.6	13.6	7.9	9.3

[1]Includes soap, detergents, cleansers, household supplies, paper, plastic, foil, pet foods, and tobacco products. [2]Includes health and beauty aids, general merchandise, magazines, and others. [3]Annual report in *Supermarket Business* magazine. [4]Pet foods are probably included in food.

Table 10—Supermarkets as share of grocery stores

Year	Minimum annual sales to be classed as a supermarket[1]	Number	Sales	Share of all grocery—	
				Stores	Sales
	Thousand dollars	Thousands	Million dollars	——— Percent ———	
1935	302.9	386	202	0.1	3.2
1939	287.5	1,699	772	.4	10.0
1948	635.6	5,600	5,654	1.6	22.8
1954	703.4	10,506	14,214	3.8	41.3
1958	747.0	15,282	23,562	5.9	53.9
1963	762.9	21,167	31,484	8.6	59.9
1967	825.7	23,808	43,433	10.9	66.7
1972	1,000.0	27,231	64,960	14.0	69.6
1977	1,545.3	30,831	113,111	17.2	75.0
1982	2,313.2	26,640	175,655	14.4	74.5

[1]1972 = $1 million; other years were calculated using an index of prices of all products sold in grocery stores. Sales include sales taxes.

The reason for the constancy of the census figure is that an accurate breakout of sales by group was difficult to obtain before the late 1970's. Until the advent of the electronic cash register, food store operators had no way of determining what share of their sales of groceries consisted of food products and what share consisted of soap, detergents, paper towels, and other nonfood grocery products. As a result, grocery store operators provided the census with their best guesses, which did not change for many years. Informal conversations with officials of major food store chains several years ago found that one chain had reported 80 percent of grocery store sales as food for many years and another chain had reported 85 percent. Most of the change from 1977 to 1982 was caused by the chain that had reported 85 percent switching to 80 percent.

For total expenditures, we use *Supermarket Business* figures, which are based on sales records for several hundred categories of foods and nonfoods. *Supermarket Business* figures are reported by a limited number of stores but have the advantage of providing annual data on a consistent basis since 1947. Using a larger sample as a base would be preferable, but no such series is available.

The analyst must decide how much of restaurant and hotel meal sales should be attributed to personal expenditures and how much to business travel and entertainment. CES and NFCS supply data bearing on this topic, but it has been shown how strongly both are affected by the methodology choice. And until the CES became a continuing national survey in 1984, the 10-year intervals between surveys also created problems.

As far as can be learned, no data on business expenditures have ever been collected or published. Therefore, the analyst simply decides that so many dollars are personal expenditures and the rest are business expenditures.

Food Prices

A major component of any demand analysis is price, so the characteristics of available price series and how well they match up with quantity series are important. The principal source of data on retail price movements is BLS. BLS has compiled retail price indexes and some retail prices since 1890. Beginning in 1978, coverage was expanded to the entire urban portion of the country. Before then, only prices paid by clerical and manual workers in cities were represented. BLS collected prices for a sample of individual food

products that were fairly narrowly defined using detailed specifications for each product through 1977. Since then, the indexes have reflected a broader coverage of food products, but the component price in each store is still for a narrowly specified product.

BLS for many years collected prices on Tuesday, Wednesday, and Thursday of the first week of the month that included a Tuesday. This practice minimized the effects of weekend specials designed to lure shoppers into the store for the major weekly shopping trip. Price collection was extended in 1978 to three pricing periods, each including 6 business days. This procedure includes most of the month and ensures that a higher proportion of the prices collected will reflect specials, although they do not allow for the sales increases resulting from the lower prices of specials.

Besides the BLS series, USDA's National Agricultural Statistics Service (NASS) and predecessor agencies collected prices paid by farmers for individual food products from 1910 to 1976. These prices were for products usually purchased by farmers in a particular store, not for the narrowly defined products priced by BLS.

Good information is available from BLS on price movements in the form of indexes. Data on actual price levels that are available are much less satisfactory because they are not designed to provide such information. Analysts must turn to other sources to determine the average level of prices for all purchases. The primary source of such data is USDA's periodic surveys of food consumption and purchases conducted since the mid-1930's. Average prices can be imputed from the quantity and value data that the surveys provide for individual products. David Smallwood of ERS calculated imputed average prices for purchased foods in the 1977-78 NFCS. Corinne LeBovit of ERS had earlier calculated similar prices from the spring portion of the 1965-66 HFCS.

To match up price and quantity series, the analyst must group products, often in ways not used by those who constructed the price series. Every food for which demand analysis has ever been done was a grouping of many products. Beef consists of many cuts. Milk is whole, lowfat, or skim and is sold in a variety of containers. Eggs are sold in several sizes at different unit prices, and sometimes more than one grade is available. There is always a diversity of brands and prices and often of package sizes.

BLS aims at measuring "pure" price change, so the price in one month is compared with the price of the

same product in the preceding month in the same store. The indexes for each store are then combined into a price index for milk, for example. A look at milk prices, on which I have worked extensively, illustrates the problem facing the demand analyst who wants to use comparable price and quantity series.

Milk

The match of readily available price and quantity series for milk is especially troublesome. The basic product group priced by BLS has been plain whole milk (excluding flavored whole milk, lowfat milk, and skim milk). The starting date for this analysis is 1954, because that will give us a bit more than the "large sample" size of 30 annual observations. Since then, there have been major changes in the mix of products, size of containers, and methods of distribution. In the 1930's, over 70 percent of whole milk used at home was home delivered. By 1954, about 50 percent was home delivered. Today only 2-3 percent is home delivered (Manchester, 1983, p. 91). Thus, the analyst can hardly exclude prices of home-delivered milk in calculating measures of milk prices over the past 30 years. If an analyst needs only 10 years of data, he or she can omit home delivery without risking accuracy.

The containers in which milk is sold have changed dramatically in 30 years. Glass bottles gave way to paper cartons and then to plastic containers. Nearly 30 percent of milk sold for home use in the early 1950's was sold in quarts, about 60 percent was sold in half gallons, and about 10 percent was sold in gallons. By 1979, only 7 percent was sold in quarts, 30 percent was sold in half gallons, and 60 percent was sold in gallons. Today quarts account for even less.

The mix of whole milk products also changed. Creamline milk, which is nonhomogenized milk, was sold in most markets in 1954, often at a lower price than homogenized milk. Creamline has virtually disappeared. Homogenized milk with vitamin D supplements often carried a premium over homogenized milk in 1954. Now, almost all milk has vitamin D and other vitamins added.

Computing an average price poses challenges in light of price differences for diverse product forms, containers, and distribution methods. BLS, for instance, priced separately store and home-delivered whole milk through 1973. After that, it priced only milk bought at the store. The types of milk priced in each city varied until 1956, depending on the predominant type sold during the base period. In July 1956, BLS changed the

store specification to homogenized vitamin D milk in all cities. This action had no effect on the indexes but raised the average price for all cities 0.1 cent per quart. Both store and home delivery prices were switched in 1963 to half gallons. In 1978, BLS changed from its longstanding policy of price indexes that represented the change in prices of fairly narrowly defined products—such as only homogenized vitamin D milk sold in half gallons. The new sample design selected a single product in each store from all of the products in a category such as whole milk. Thus, half-gallon prices were reported in some stores and gallon prices in others, but always the same one in each store from month to month.

To calculate average prices for plain whole milk, I used data from 150 markets throughout the country to deal with the myriad prices and price differentials. Because the primary interest was in average prices and margins for individual markets, the only national averages available are those shown in table 11. BLS store prices linked to the various containers rose 172 percent between 1954 and 1981, while average prices in stores rose 159 percent. If home delivery is included, average prices rose 146 percent in the same period. Table 11 shows comparisons for subperiods.

Plain whole milk has been displaced rapidly by lowfat milk since the 1950's. Yet there is less information available on the prices of lowfat and skim milk. BLS calculated a price index from 1964 to 1977 for "skim" milk in half-gallon containers, which included lowfat milk in some stores. Since 1978, the series has included "other milk and cream" in all containers. Compared with BLS indexes for whole milk, price movements for these milk products were:

Period	Whole milk	"Skim" milk	Other milk and cream
	Percentage increase		
1964-77	78.7	102.9	—
1978-87	34.6	—	36.8

— = Not available.

Thus, prices of skim and lowfat milk apparently rose much faster than those of whole milk before 1977 and somewhat faster since then. But if one applies these indexes to prices from the sample 150 markets in 1969, the price of combined lowfat and skim milk exceeds the price of whole milk by 1980. This result is inconsistent with the "average prices" computed by BLS for whole, lowfat, and skim milk, which shows the

average of lowfat and skim milk to be about 5 cents per half gallon lower than that of whole milk. (These "average prices" are the average of all the prices collected by BLS, in which all containers are converted to a half gallon of milk; that is, half the price of a gallon and twice the price of a quart.)

Combining all pieces of information, I calculated average prices for whole milk and for lowfat and skim milk combined. I averaged quarts, half gallons, and gallons, including store-bought and home-delivered milk. Each received a weight representing sales in the given year:

	Percentage change	
	1954-73	1954-87
BLS-whole milk:		
Store bought	57.4	185.7
Home delivered	68.4	—
Average prices:		
Whole milk	44.2	157.0
Whole, lowfat, and skim milk	42.2	151.8

— = Not available.

Figure 1 and appendix table 1 show the resulting price indexes.

To the demand analyst considering which price series to use, the key point is what effects the use of the different price indexes will produce. In a simple calculation using only prices, incomes, and per capita sales (excluding milk produced and consumed on the same farm) of beverage milk products, the price elasticities using whole milk prices and all-milk prices were:

	Price elasticity
Calculation using BLS store prices for whole milk	-0.15
Calculation using average prices for whole, lowfat, and skim milk	-.19

Beef

Beef prices provide another example of the problems in matching price and quantity series. Beef as purchased is made up of many different cuts and three classes—Prime, Choice, and "no-roll." USDA grades beef as Prime and Choice and places the grade designation on the carcass. No-roll is mostly graded by USDA, but the grade is not "rolled" on the carcass. Much of the no-roll beef is leaner than Choice.

Marketing practices in the meat industry have changed drastically over the past 25 years. Beef used to be

Table 11—Price indexes for plain whole milk, 1954-87

Year or period	BLS index[1]			Manchester index			
	Container priced	Home delivered	Store bought	Store bought half-gallon, paper container	All containers		
					Store bought	Home delivered	Total
	Percentage of 1954						
1954	*	100.0	100.0	100.0	100.0	100.0	100.0
1963	*	114.4	111.9	109.0	109.4	111.1	108.7
1973	*	168.4	157.4	152.2	149.6	154.5	144.2
1977	*	—	200.6	196.0	192.0	192.8	183.3
1981	*	—	272.2	264.1	258.8	—	246.4
1987	*	—	285.7	—	—	—	—
	Percentage change						
1954-63	Quart	14.4	11.9	9.0	9.4	11.1	8.7
1963-73	Half gallon	47.2	40.7	39.6	36.7	39.1	32.7
1973-77	Half gallon	—	27.4	28.8	28.3	24.8	27.1
1977-81	All	—	35.7	34.7	34.8	—	34.4
1981-87	All	—	5.0	—	—	—	—

— = Not available. * = See entry below in *Percentage change* section of the table for container priced by BLS in each period.
[1] BLS = Bureau of Labor Statistics, U.S. Department of Labor.
Sources: U.S. Department of Labor, Bureau of Labor Statistics; Manchester, 1983, p. 217.

sold by the meat packer in carcass form and then cut up either by wholesalers, by chain stores in their warehouses, or by retail stores in the store's butchering room. Most beef is now cut up by the packer and sold as boxed beef (Crawford and others, 1988, p. 11). Beef sales from restaurants, especially fast food hamburger chains, have boomed. Consumer preferences have changed, most notably tilting toward leaner beef, and marketing practices have responded.

BLS price indexes are intended to measure pure price change, not the kinds of market change described above. BLS publishes price indexes for five individual cuts, other beef and veal, and the aggregate of beef and veal. Until 1977, the individual cuts that were priced were products that met detailed specifications. Except for ground beef, these specifications usually included grade. Since 1977, all grades have been included. Weights were changed when CES results became available, approximately every 10 years (table 12). Now that the CES is conducted on a continuing basis, weights will be changed more often.

ERS for many years has estimated an average price for Choice beef to use in calculating price spreads, but recent changes in marketing methods led ERS to con-

Table 12—Changes in relative importance of beef and veal cuts used in computing the Consumer Price Index (CPI)[1]

Cut	Relative importance of each cut based on Consumer Expenditure Survey (CES) covering—		
	1960-61	1972-74	1982-84
	Percent		
Ground beef	24.0	24.6	36.8
Chuck roast	6.7	11.8	8.4
Round roast	10.2	9.4	5.2
Round steak	16.3	6.2	8.5
Sirloin steak	9.2	7.1	7.8
Other beef and veal	33.6	40.9	33.3
Total	100.0	100.0	100.0

[1]Quantities purchased in survey period shown valued at December 1986 prices.

Source: U.S. Department of Labor, Bureau of Labor Statistics.

struct additional series. A basic assumption of the Choice series was that the various cuts are represented in carcass proportions. Because of changes in industry practices and increased consumer interest in leaner (non-Choice) beef, the price of Choice beef has come to represent a declining proportion of all beef.

Figure 1
Milk prices by various measures, 1954-87

Percent of 1954
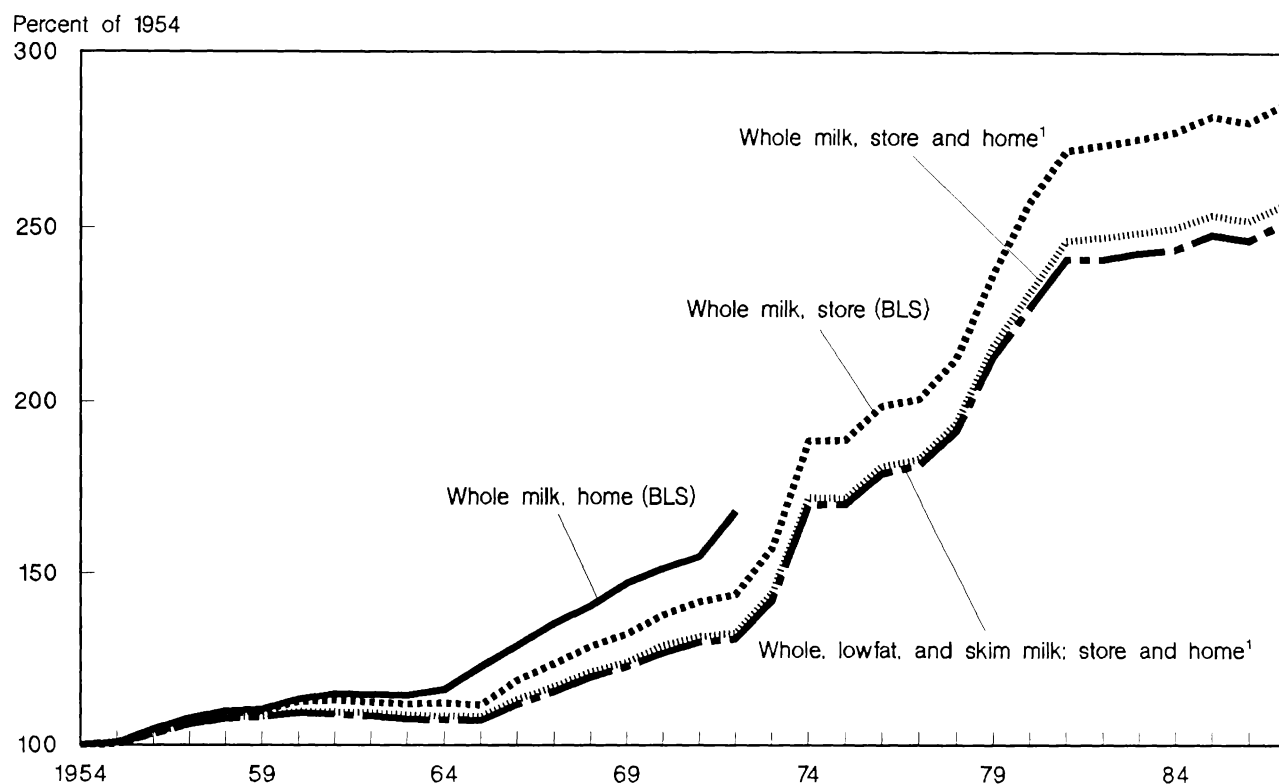
1/ This report. Source: Appendix table 1.

Therefore, ERS recently added a price series for all beef that combines the prices of Choice beef with those of other grades and also varies the weights for non-Choice (especially hamburger) beef (Duewer, 1988). The starting date of the series is 1987, so it will be several years before a time series will be available.

I constructed an alternate time series for beef prices that uses some of the same ideas as the ERS all-beef price. It uses 1960 as the starting date. BLS prices for non-Choice, non-Prime cuts first became available only in 1987, so other data are used. The alternate time series combines the ERS Choice beef price with prices for frankfurters and luncheon meats (using an estimate of 25 percent of the production of frankfurters and luncheon meats made from beef), canned specialties (soup, baby food, chili, for example), and frozen specialties (dinners, entrees, pizzas, for example). Figure 2 shows the resulting series compared with the BLS index for beef and veal.

Which price series is chosen to analyze beef demand substantially affects the results. For example, using nominal prices, nominal per capita disposable income, and per capita consumption of all beef in a simple analysis gave the following elasticities:

	Own-price elasticity	Income elasticity
Prices for Choice beef	-0.31	+0.26
Prices for all beef	-.51	+.44

Which BLS Series?

BLS, beginning in December 1977, constructed two different sets of price indexes to expand coverage of the CPI. The new, more broadly based CPI for all urban consumers (CPI-U) took into account the buying patterns of professional and salaried workers, part-time workers, the self-employed, the unemployed, and retired people as well as wage earners and clerical workers who had constituted the entire universe for the index since 1890. The old index was continued. It is now called the CPI-W.

The populations covered by the two post-1977 indexes are as follows:

Figure 2
Retail beef prices by various measures, 1960-87

Percent of 1960
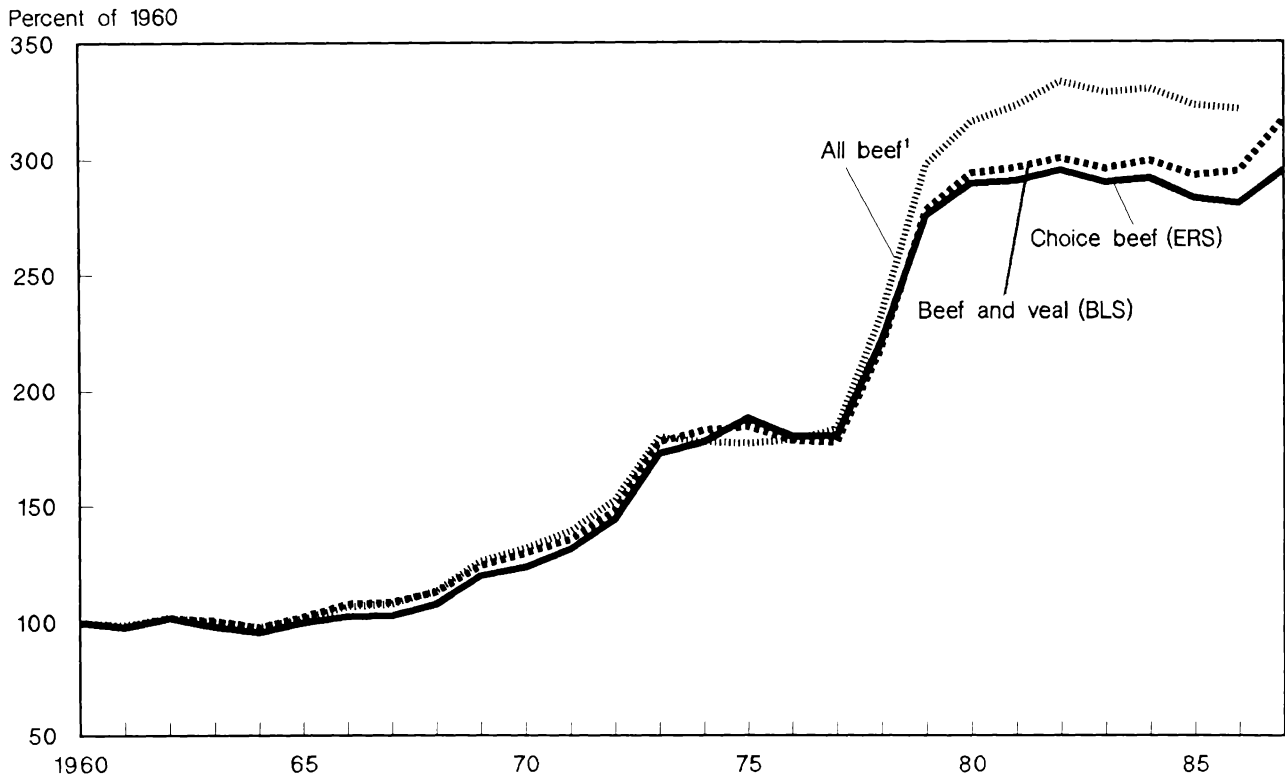
1/ This report.   Source: Appendix table 2.

15

• The all-urban consumer population consists of all urban households in Metropolitan Statistical Areas (MSA's). Some of these households are in rural areas, although most live in cities and suburbs. The coverage includes nonfarm families living in rural areas within MSA's but excludes other rural families, military population, and institutional population.

• The population of urban wage earners and clerical workers consists of families with clerical workers, sales workers, craft workers, factory workers, service workers, or laborers. An urban wage earner or clerical worker, to be included, must be the member of the family who earns more than half of the family income and has worked for at least 37 weeks during the survey year.

The CPI-U introduced in 1978 represents the buying habits of about 80 percent of the noninstitutional population of the United States, compared with only 40 percent represented in the older CPI-W index. The methodology for producing both indexes is the same for both populations, except that, for housing, the way to estimate homeowner shelter costs for the CPI-U was changed to rental equivalence in January 1983 and was not changed for the CPI-W until January 1985. The two indexes differ chiefly in weights used. The specific outlets (stores) included in the indexes differed from 1978 to 1981.

If one analyzes time series that extend back before 1978 (as will most analyses using annual data), one is faced with a choice: Use the consistent series (CPI-W) throughout or opt for the more complete coverage of the CPI-U in more recent years.

The differences seem minor for most food categories such as "beef and veal" and "cereals." Comparing 1987 annual indexes with the base of December 1977, the CPI-U and CPI-W figures differ by less than 1 percent. The exception is fresh fruit, and the big difference is in oranges. The CPI-U index for oranges is 10 percent higher than the CPI-W index for oranges. The implication is that the weights for different kinds of oranges and the stores at which the two groups buy oranges must differ substantially between the two indexes.

Among nonfood groups, housing and household furnishings figures for the two indexes differ considerably. The reason is that the CPI-U shifted to rental equivalence for homeowners' costs in 1983 and the CPI-W shifted in 1985. Differences in movement are minor for most others.

Price of All Food

Analysts, in conducting food demand analysis, may need an index that measures the price of all food. They face the choice of which index is best suited to their analysis. Price indexes for food, and its at-home and away-from-home components, are available from BLS and from BEA's NIPA's. Two other measures that gauge the price of all food were prepared in a recent study (Manchester, 1987).

The BLS indexes use fixed weights that are revised approximately every 10 years. The implicit deflator for personal consumption expenditures on food, the gross national product (GNP) deflator, is calculated by dividing current food expenditures by food expenditures at fixed retail store prices. The latter are calculated using BLS price indexes for major food groups and the ERS consumer expenditure figures from the marketing bill (plus fish and imports) as weights. The weights have not changed since 1984.

Link-and-chain price indexes are another option open to the analyst. I constructed a link-and-chain price index that allows for the effects of both annually changing weights and the change in average price for each product group between 1967 and 1977.

The index was created by calculating a link index for each pair of years using the first year's quantities (disappearance for domestic consumption) as weights. These indexes of year-to-year change in price were then chained together using 1977 as the base year (table 13). The index also includes the effects of changes in the uses of products such as flour, sugar, fats, and oils between 1967 and 1977 and between 1977 and 1982. The resulting link-and-chain price index for food at home rose more between 1960 and 1984 than did either the BLS index or the GNP deflator. It rose

Table 13—Eight measures of food prices

Measure	1960	1965	1970	1975	1980	1984
			1977 = 100			
All food:						
BLS	45.8	49.1	59.8	91.3	132.5	157.6
GNP deflator	46.7	49.3	61.8	93.6	131.4	157.4
Food expenditures deflator	45.0	47.9	58.1	93.4	133.2	149.0
Off-premise food:						
BLS	47.1	50.2	59.8	92.4	132.2	153.8
GNP deflator	48.4	51.9	62.3	95.7	131.0	154.7
Link-and-chain	43.6	46.3	55.4	93.8	131.4	149.6
Meals and snacks:						
BLS	40.6	45.4	59.9	87.0	133.3	159.7
GNP deflator	41.1	45.9	60.5	87.7	132.4	165.2

243 percent, compared with 227 percent for the BLS index and 222 percent for the GNP deflator. Allowing for changes before 1967 would increase this disparity. Most differences between the BLS index and this link-and-chain index are due to changes in the mix of package sizes, qualities, and brands, and to changes in product use.

Using this link-and-chain price index, I adjusted expenditures at retail store prices to 1977 price levels. Sales of meals and snacks at 1977 retail store prices were adjusted by adding the purchases of food for institutions, also at 1977 levels. This adjustment gives an estimate of total food expenditures at 1977 prices. The implicit deflator was calculated by dividing food expenditures at current prices by food expenditures at 1977 prices (table 13). These calculations indicate that the prices of all food in 1960-84 rose 231 percent. By comparison, the BLS index measured an increase of 244 percent and the GNP deflator measured an increase of 237 percent.

Wholesale Prices

A mismatch between price and quantity series often confronts the food demand analyst because retail price measures available for individual foods and food groups are restricted to food used at home, but quantity data from supply and utilization tables also include food service and food used as ingredients. One suggestion is to use wholesale prices rather than retail prices. For many applications, this approach would require adding an analysis of wholesale-retail price relationships.

An analysis of this kind rests on an implicit assumption that the movement of prices of foods destined for different market segments is similar. Because evidence is lacking on this point, assumption is the only basis on which that decision can be made. But is it plausible to assume that price movements are similar for the following segments?

• Branded consumer products.

• Private-label consumer products.

• Generic consumer products.

• Branded prepared products for food service.

• "Commodities" for food service.

• "Commodities" for food ingredients.

In using wholesale prices and quantities, one is dealing with derived demand, which is one or two steps further back in the marketing chain than the usual analysis. However, this is nothing new, since any demand analysis deals with derived demand rather than with final demand (the demand of the individual who actually eats the food is not recorded on a systematic basis). What is being observed, in other words, is the behavior of the household purchasing agent, not that of the individual eating the food.

The Producer Price Index (PPI), published by the BLS, is the chief information source on movements of wholesale prices. The PPI covers the selling prices of manufacturers and of packer-shippers of eggs, fresh fruits, and fresh vegetables. BLS prepares indexes for commodities and for the output of industries. The latter are combinations of indexes for the outputs of each industry, using fixed weights. Most prices are collected from manufacturers. USDA market news prices, however, are used for raw agricultural goods such as grains, cattle, cotton, raw milk, fruits, and vegetables.

USDA market news prices provide more detail for many products than does BLS. The poultry example, which appears later in the report, shows how data of the kind published by market news can be used. Market news prices also cover the entire month, rather than the single day's prices used in the PPI.

Using wholesale prices avoids the mismatch of retail store prices and total quantities including food service. This becomes a less defensible assumption with each passing year as food service accounts for a rising share of all food.

Food Quantities

Consumption is an economic term meaning to use for satisfying wants or for producing a product. Applied to food, consumption has been defined as: quantities of food purchased, quantities of food used to prepare meals, or quantities of food eaten (ingested, in the language of nutritionists).

Demand analysts are interested in the first concept of food consumption (food purchases) and corresponding food prices and expenditures. The household portion of the NFCS measures food used in preparing meals at home, while the individual portion measures the quantities of food eaten. When NFCS becomes a continuing survey that samples the entire U.S. population, time series will gradually become available for the last two measures of food consumption. Until then, one is

limited to the estimates of food purchases that are discussed below.

The main sources of time series data on quantities are ERS per capita consumption, obtained from supply and utilization tables, and commercial data, based on information from retail food store sales and consumer panels. Supply and utilization data cover all consumption of food for use at home, away from home, and as an ingredient in other products. Consumer panel data indicate quantities of food purchased for use at home and the number of away-from-home occasions when the specified food was purchased. For example, they show the number of times steak was eaten but not the size of the steaks. Retail sales data are available only from supermarkets, although the estimated aggregates are usually expanded to include estimated sales of all grocery stores or all food stores. This discussion focuses mainly on ERS consumption data.

Methodology for constructing food consumption and utilization series and the data sources they use are described in a USDA handbook published in 1972 that has been updated.[6] Data are published in *Food Consumption, Prices, and Expenditures,* an annual ERS statistical bulletin.

ERS publishes per capita consumption data for over 200 foods, mostly defined at the manufacturing level. All uses of flour, for example, are included. Figures for most animal products include food produced and consumed on the same farm. Products produced and consumed on the farm are now a small part of the total of all products, although they were once significant. Analysts using 30 years of data should be aware that home production was significant in the 1950's for milk and eggs, among others.[7]

Home production can be removed from some of these series, since it is separately reported, but then an analyst must confront the problem of determining the appropriate population figure to use in calculating per capita consumption. This task would be considerable if an analyst wished to cover all series that include home production.

Food donated by the Federal Government through food programs is also included in consumption. Because donations are affected by different variables than are sales, they probably should be excluded in many

demand analyses. Donated foods, however, replace purchased food to some extent, so the analyst should be aware of such effects. Donated food distributed through the Temporary Emergency Food Assistance Program (TEFAP) significantly affected the sales of cheese and margarine during the 1980's (USDA, 1986 and 1987).

Data on the use of some products in other foods are available from USDA and trade associations. Data are available on the following products:

- Sugar (U.S. Department of Agriculture, National Agricultural Statistics Service (NASS).

- Peanuts (NASS).

- Potatoes (NASS).

- Nonfat dry milk (American Dry Milk Institute).

- Whey (Whey Products Institute).

- Rice (ERS survey conducted every 2-3 years).

- Most fruits and some vegetables; fresh, canned, frozen, juice, and so forth (NASS).

Food Service

There are no separate time series data on food service use, at-home use, or ingredient use of food. As a result, analyses are often conducted using total quantities—which encompass home use, away-from-home use, and ingredient use in manufactured food products—and retail store prices.

While no time series are available on use of individual foods in food service, substitute measures can be calculated. If the analyst has data on retail store sales, he or she can estimate the use of food in food service as a residual for products that have no significant use as an ingredient in other products. This condition, however, severely limits the number of commodities for which the analyst can estimate such a series.

Separating retail sales of food destined for home use from that destined for food service use involves going to sources of data other than the ERS supply-utilization balance sheets that yield an estimate of aggregate disappearance or economic consumption. Consumer panel data from the Market Research Corporation of America (MRCA) provide estimates of home use, but only for products for which a client has been willing to pay. Store audit data and, more recently, scanner data provide information on packaged foods, but they have

[6] U.S. Department of Agriculture, Economic Research Service, *Major Statistical Series of the U.S. Department of Agriculture Products, Volume 5: Consumption and Utilization of Agricultural Products,* Agricultural Handbook No. 671, vol. 5, Oct. 1989.
[7] See Manchester, 1987, for some cases.

not yet been expanded to cover fresh meats and produce. They are commercial data and a price is involved. Much of these data are available for only a few years, although the number of time periods can be dramatically increased by using monthly or quarterly data. In that case, data for 4-week periods may have to be converted to monthly estimates to match the prices.

Market Score (Data Development Corporation) carries out surveys of the food service market that identify quantities of and expenditures for foods at a fairly disaggregated level. Surveys of this kind are expensive and their availability depends on having a well-financed sponsor. Until such funds become regularly available, only limited data will be available. And it will require years to build up a time series.

ERS conducted two surveys in cooperation with the Institutional Food Manufacturers Association (IFMA) that give data on the use of individual food products in food service (Van Dress, 1971, and Van Dress, 1982). Connor combined data from the latter survey with census data for 1977 and estimated the three market segments (home use, food service use, and ingredient use) for a large number of foods (Connor, 1982).

Separating use in comminuted manufactured products, products combining several ingredients, presents major challenges. Problems can often be minimized by the way subseries are combined. For example, consider the Standard Industrial Classification (SIC) category "Dry, Condensed, and Evaporated Dairy Products." Most component products can be grouped in classes of similar products.

Consumer and food service products would include:

- Canned evaporated and condensed milk.

- Canned eggnog.

- Milk shake mix.

- Cream substitutes.

- Dietary supplements.

- Dried and canned cream.

Products used mostly as ingredients, often in other dairy products, would include:

- Bulk condensed milk and skim milk.

- Casein.

- Dry milk products except nonfat dry milk.

- Whey.

- Ice cream mix and ice milk mix.

- Lactose.

- Malted milk.

The one product that is not readily classified into one of the above groups is nonfat dry milk. Most nonfat dry milk is used as an ingredient, mainly in other dairy products, but significant quantities are "instantized" and packaged for consumer use. The American Dry Milk Institute's annual survey of dry milk, however, provides the data needed to make the required division.

The categorization above does not divide the first group between consumer and food service use. Only a partial grouping is possible. The canned items and dietary supplements are mostly used at home. The others are used both at home and in food service.

Deflation

Until now, we discussed quantity measures determined directly; that is, from measurements of quantities in physical units. The other method of deriving a quantity measure is to deflate value by a price index. This kind of calculation calls for extreme caution: "In general, in a world in which input and output levels are altered by price change, a satisfactory price index does not imply a satisfactory quantity index" (Archibald, 1977, p. 7).

A Laspeyres index (using base-period weights) will yield a measure of pure price or quantity change. But multiplying an index of pure price change by an index of pure quantity change will not yield an exact measure of the change in value or expenditures (Fox, 1968, pp. 135-39). To derive such a measure, one must multiply a Laspeyres index for price by a Paasche index for quantity or vice versa. The implicit price deflators in the NIPA's attempt to follow this logic, although data problems make them somewhat shaky. Thus, dividing an expenditure series by a BLS price index does not yield an index of pure quantity change.

Time

Time increments are basic elements of food demand analyses, serving as fundamental units of computation. Which ones are used and how they are used can affect research outcomes significantly. If the analyst is using ERS per capita consumption data, only annual figures

are available for most crops. Quarterly data are available for most animal products, however.

Data for a number of crops are reported by crop year rather than calendar year. This practice creates comparability difficulties between quantities and prices, and between various products. Most price data are monthly, so crop-year retail or wholesale prices can be calculated easily with the help of a computer. Alternatively, supply and utilization tables for many crops can be recast on a calendar-year basis with somewhat more effort.

Periods in which national price controls were in effect are often excluded on the grounds that supply and demand were not operating freely. World War II and the Korean War were customarily omitted, but time series that reach back that far are now seldom used. The effects of the Economic Stabilization Program of 1971-74 are mostly ignored, apparently on satisfactory grounds. A program participant who evaluated the effects of direct wage and price controls on food prices in 1972-74 concluded that there was little impact. Prices of raw agricultural commodities were exempted. Price spreads of processors and retailers were squeezed. Rigid price ceilings created distortions. Other policy measures had more effect than did direct price controls. Some exports were restricted. Increased imports were permitted for products under quotas, such as meat and nonfat dry milk. These measures increased supplies available to the domestic market (Nelson, 1974, pp. 107-8; for previous price controls, see Rogers, 1972).

Population

Most time series analyses use per capita consumption figures. The practice is based on the premise that the increase in total use due to population growth should be excluded. Though this general proposition is widely accepted, it does not solve all the problems surrounding choice of a population series.

Starting with data for the World War II era, ERS published per capita civilian consumption data which were widely used. Post-World War II per capita civilian food consumption generally was the same as that based on total population because the military population during that time usually was small. But problems with both the data on military food purchases and military population led ERS to change to a concept of total population that includes civilians and the military.

Data for military purchases included food served in messhalls and some food sold in commissary stores.

Overseas purchases of some foods (meat bought in Europe for troops stationed there, for example) were excluded. The military population includes soldiers living and eating on base and soldiers living at home with their families who eat some meals at home. For example, soldiers often ate lunch (or all meals when on maneuvers) on base but ate other meals at home.

The impossibility of achieving a satisfactory match of quantity and population figures led to the decision to combine civilian and military food use and population figures, although military figures will continue to be available for many products. Per capita consumption typically will be calculated for the total population (including troops stationed overseas but excluding their families) because supplies purchased in the United States are used to feed overseas troops. Resident population will be used to compute consumption of foods such as fluid milk that are not shipped overseas.

Another data alternative is to use adult equivalents. This option is based on the observation that all people are unlikely to consume equivalent amounts of the same food. Infants, for example, consume less steak and more baby food than do adults. In recognition of this phenomenon, some analysts have computed adult equivalents that differentiate between the young and the old and sometimes differentiate between the sexes. Adult equivalents depend on cross-sectional data obtained from surveys. Some are based on expenditures for food consumed at home (Salathe and Buse, 1979). A few are based on food intake (food eaten both at home and away from home) tabulated by the NFCS (Schrimper, 1975).

Adult equivalents can be calculated only infrequently because survey data were available only at intervals until the 1980's. They also seem to change over time. It is hard to say to what extent the change is due to survey methods (Pao and Sykes, forthcoming).

The choice of which adult equivalent scale to use can make a major difference in the results obtained, because the effects of age and sex change over time. Effects of both age and sex on daily milk intake are clearly evident (fig. 3). But comparing 1965 and 1977, daily intake declined for all age groups except women 65 and over. Whereas use of the 1965 relationships indicated a strong effect of the changing age/sex distribution on consumption by 1986, the 1977 relationships showed little effect. Per capita consumption at 1965 rates applied to the projected 1986 age/sex distribution was 260 pounds per capita. At 1977 rates, the projected per capita consumption was 229 pounds. In other words, the age-sex distribution effect on milk consumption had largely disappeared by 1977.

Income

Demand analysts often use income measures, and their choice of measure may condition the results of the analysis. Two key issues surround the choice of income measures:

• Different measures give varying levels of aggregate and average income.

• The mix of income sources has changed over time, potentially affecting the way financial resources are divided among goods and services.

Most income series nominally measure money income, but what constitutes money income varies from one source to another. In fact, a definitive definition of money income is probably not possible because there are too many kinds of income whose classification is ambiguous. Take some familiar issues. Are food stamps money or nonmoney income? Both sides of that question can be argued. How about Medicare? Is it money or nonmoney income? A case can be made for both views.

The two most widely used measures of income are:

• Personal income or disposable personal income taken from the NIPA's. These measures are often used in per capita form.

• Money income of persons, families, or households as measured by the Current Population Survey (CPS). This measure is often used when an analyst wants a distribution or an average for families or households.

Coverage

Personal income includes the following types of non-money income that are not included in the CPS definition: wages received in kind, the value of food and fuel produced and consumed on farms, the net rental value of owner-occupied homes, the property income that mutual life insurance companies receive, and the value of services that banks and other financial institutions render to persons for which no fees are charged. These in-kind items account for about 4 percent of total personal income.

Income as measured by the CPS, on the other hand, includes such items as regular contributions for sup-

Figure 3
Daily intake of milk drinks by age and sex, 1977-78
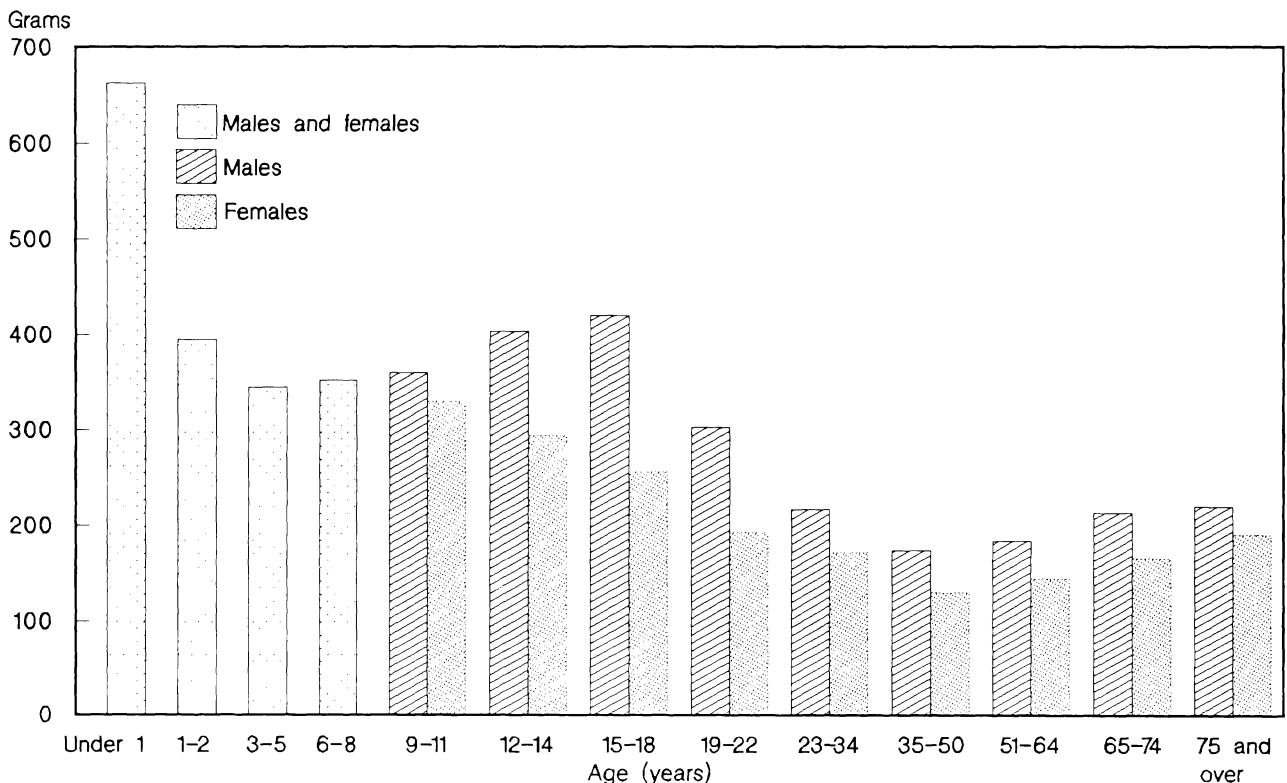
Source: *USDA Nationwide Food Consumption Survey 1977-78.* 48 conterminous States.

port received from persons who do not reside in the same living quarters; income received from roomers and boarders residing in households; and employee contributions for social insurance, which are not included in the personal income measure. These items, however, represent a much smaller income total than the nonmoney items included in personal income.

The CPS excludes from its sample inmates of institutions and military personnel stationed overseas or residing on post in the United States (except for a few living on post with their families). Also, the income of persons who died or emigrated before the interview date is not reported in the census inquiry. The income of these groups is included in aggregate personal income. The civilian institutional population was 1.2 percent of the total resident population in March 1985. The Armed Forces population living without families on post in the United States at that time was 0.3 percent. The money income of these two groups likely con-

stituted considerably less than 1.5 percent of total money income.

The personal income series is estimated largely on the basis of data derived from business and government sources. These sources include the industrial and population censuses, employers' wage reports under the Social Security programs, and government agency records of disbursements to individuals. The income data presented in the census reports, on the other hand, are based directly on field surveys of households.

Income data obtained in household interviews are subject to various types of reporting errors that result in understated income. It is estimated that the Bureau of the Census income surveys conducted in the past few years obtained about 90 percent of the comparable total money income aggregates and about 98 percent of the comparable money wage or salary aggregates derived from the personal income series (table 14). The CPS aggregate was 74.4 percent of total personal

Table 14—Comparison of components of aggregate money income in 1983 as estimated by Consumer Population Survey (CPS) with independent estimates of aggregate money income

Income source	Money income estimated by—		CPS as share of independent source	CPS percent allocated
	Independent source[1]	CPS		
	——— Million dollars ———		——— Percent ———	
Total income	NA	2,201.2	NA	20.1
Total income, independent estimates	2,402.5	2,164.9	90.1	20.0
Sources with independent estimates[1]:				
Wages or salaries	1,632.3	1,616.3	99.0	17.9
Nonfarm self-employment	104.1	119.8	115.1	32.9
Farm self-employment	8.5	10.3	121.3	21.4
Social Security/railroad retirement	155.2	142.3	91.7	20.5
Supplemental Security Income	9.0	7.6	84.9	17.6
Aid to Families with Dependent Children	13.8	10.5	76.0	12.8
Interest	220.9	99.4	45.0	34.0
Dividends	60.2	27.3	45.4	33.6
Net rent and royalties	34.3	16.5	48.1	22.1
Veterans' payments	14.0	8.8	63.3	17.3
Unemployment compensation	26.1	19.7	75.5	19.1
Workers' compensation	14.1	6.6	47.0	25.0
Private pensions and annuities	54.7	34.6	63.3	23.9
Federal Government and military retirement	34.9	31.8	91.2	24.3
State and local government retirement	20.5	13.3	64.7	19.7
Sources without independent estimates:				
Estates and trusts	—	6.7	NA	28.2
Alimony and child support	—	8.3	NA	15.3
Contributions from persons not living in household	—	5.4	NA	21.6
Other public assistance	—	2.4	NA	19.5
All other money income	—	13.6	NA	22.3

— = Not available. NA = Not applicable. [1]Independent sources are series of other Government agencies, many from the NIPA's. For this table, these independent estimates have been adjusted to CPS concepts.

Source: Money Income of Households, Families, and Persons in the United States: 1984, U.S. Department of Commerce, Bureau of the Census, P-60, No. 151, April 1986.

income (including the noncomparable items) plus personal contributions for social insurance. The CPS has some other drawbacks. The survey underreports less common or less frequent types of income. Twenty percent of CPS is "allocated" by statistical techniques rather than by direct field interview.

Averages

Average personal income is calculated as income per capita. That is, it is derived by dividing total income by the total population of men, women, and children. Most of the CPS averages, in contrast, are for households, families, unrelated persons, or income recipients 15 years old and over. The pertinent questions for demand analysts are: Do they move together? Why or why not?

An additional consideration is that many analysts use CPS-generated median income figures rather than mean income figures. A skewed distribution causes differences between the mean and median. Nor is skewness constant over time. Therefore, somewhat different movements result (table 15).

Per capita money income as measured by CPS has moved quite closely with what I call "total personal income" (personal income plus personal contributions for social insurance) since 1967, the first year for which

it was reported (table 16). Because in-kind income has been increasing as a share of total personal income, it must be that the increasing coverage of money income has approximately offset that effect.

The next three measures in table 16 reflect well-known demographic changes: Household and family size have declined because families are having fewer children than they used to and because of changes in family living arrangements. Average household size has decreased throughout most of U.S. history (table 17).

The growth in one- and two-person households is one of the most significant parts of this change. This trend is caused by two major developments, the increase in the elderly living apart from their children and the increase in young people living apart from their parents early in their careers. Both largely result from increasing incomes. Recession and slow recovery in the early 1980's markedly slowed the decline in household size.

Kinds of Income

Different kinds of income have different effects on the ways households use their financial resources. Categorical programs, such as food stamps and housing subsidies, have the most obvious effects: Food stamps must be used for food; housing subsidies apply only to housing. Other kinds of income allow consumers more spending discretion. If income appears to be more certain, consumers are likely to be willing to spend more of their current income and to commit more of their expected income through credit purchases. The effects on food expenditures are probably indirect, as when a household food budget gets squeezed by other, unforeseen outlays, but they all bear on the question of how households allocate the resources available to them.

Table 15—Median income as share of mean income in the Current Population Survey (CPS)

Group	1947	1957	1967	1977	1984
			Percent		
Income of:					
Households	—	—	89.4	84.3	81.6
Families	85.5	88.0	90.1	87.7	85.1
Unrelated individuals	61.8	66.5	67.4	74.0	76.3
Males with income	85.4	85.2	83.1	80.0	71.4

— = Not available.

Table 16—Relationships between various measures of average income

Income measures	Average income per unit as share of average total personal income[1] per person					
	1947	1957	1967-69	1970-74	1975-79	1980-84
			Percent			
CPS per capita money income	—	—	75.0	76.6	76.3	75.2
Household income	—	—	240.1	230.6	212.9	202.3
Family income	265.8	256.9	265.7	257.7	241.3	228.7
Males with income	195.7	189.9	242.8	240.1	222.5	204.6
Disposable personal income	87.8	86.5	83.4	83.1	82.8	81.7

— = Not available. [1]Total personal income is personal income plus personal contributions for social insurance.

The mix of income sources in the United States changed substantially during the post-World War II period, especially in the last two decades. The War on Poverty in the late 1960's brought a dramatic increase in the number and size of income assistance programs, significantly changing the kinds of income available to many households. Other forms of non-money income, especially employee benefits packages, have grown markedly. Most nonmoney income is not taxed, so after-tax income rose faster than gross income.

Personal Income

A potentially more useful way to gauge personal income than the standard personal income measure described earlier in this report is a modified personal income measure. It rearranges some of the components of the standard personal income measure and adds some other data. Key features of the standard personal income measure are:

- Not all personal income accrues to "persons" in the usual sense of the word. Nonprofit organizations, producer cooperatives, and mutual life insurance companies are included as entities that accrue personal income, though they account for a small portion.

- Personal contributions for Social Security and other social insurance are subtracted before totaling personal income in the standard measure. Income tax withholding, though, is subtracted later to calculate disposable personal income.

- Personal nontaxes are netted before computing disposable personal income in the usual measure. Personal nontax payments include tuition, room, and board at public universities and public hospital charges.

- Homeowners are not treated as persons but as businesses. Their imputed income was negative in 1984.

Treatment of these items in the rearranged measure is as follows:

- Omit nonprofit organizations, producer cooperatives, and mutual life insurance companies from personal income.

- Net both personal contributions for social insurance and income tax withholding from personal income to obtain disposable personal income.

- Include personal nontaxes in personal consumption expenditures.

- Treat homeownership as part of the household, not as a separate business.

The rearranged account also includes money income from sources included in the CPS but not in the NIPA's—estates, trusts, alimony, child support, contributions from persons not residing in the household, other categories of public assistance, and all other money income. These items totaled $36 million in 1983, an amount so small it constitutes less than 0.1 percent of income. Money income from capital gains and other sources that are taxed, which are also included, equaled 2 percent of total income in both 1984 and 1964.

Personal income in 1984 was roughly 90 percent money income and 10 percent nonmoney income. Food stamps; Supplemental Security Income (SSI); Medicare; Medicaid; Aid to Families with Dependent Children (AFDC); relief; unemployment insurance; and veterans' nonmedical benefits are included but not the National School Lunch Program; Women, Infants, and Children (WIC) nutrition program; Federal donated food; military and veterans' benefits programs; low-cost housing; or meals consumed during business travel.

Personal income in 1964 was roughly 97 percent money income and 3 percent nonmoney income.

The rearranged accounts are shown in tables 18 and 19.

The portion of total income that is taxable declined from 82 percent in 1964 to 72 percent in 1984 (table 20).

Table 17—U.S. household size

Year	Average household size	Percentage of all households	
		One-person households	Two-person households
	Number	———— *Percent* ————	
1790	5.79	3.7	7.8
1900	4.76	5.1	15.0
1950	3.37	10.9	28.8
1960	3.33	13.1	27.8
1970	3.14	17.1	28.9
1980	2.76	22.7	31.4
1984	2.71	23.4	31.5
1985	2.69	23.7	31.6
1986	2.67	23.9	31.4
1987	2.66	23.6	32.0

A Cash Account for Consumers

The NIPA's present the accounts for consumer households in a form that is consistent with the U.S. Department of Commerce's purposes but not always consistent with the purposes of other analysts. A measure of use to many analysts would be a cash account.

Household finances resemble a cash account: Money flows in and money is paid out. For example, consumers start with total money income in computing income tax. But some of that money is deducted from earnings before payday for Social Security taxes, income tax, retirement, or the employee's share of health insurance, leaving take-home pay. Other funds from loans, gifts, inheritances, and other sources may be added to household income. Funds are contin-

Table 18—Personal income rearranged, 1984

Item	Total	Personal income of individuals (a + b + c)			Organizations[1]
		Cash received (a)	In-kind or imputed income (b)	Less depreciation (c)	
		Billion dollars			
Personal income paid out	3,245.8	2,749.5	634.8	− 148.5	10.0
Income excluded from personal income	121.6	63.8	57.8	0	0
Total income	3,367.4	2,813.3	692.6	− 148.5	10.0
Personal contributions for social insurance	− 133.5	− 133.5	0	0	0
Personal taxes	− 387.3	− 387.3	0	0	0
Personal nontaxes	[2]	[2]	[2]	[2]	[2]
Disposable income	2,846.6	2,292.5	692.6	− 148.5	10.0
		Percent			
Rearranged personal income:					
Total income	100.0	83.5	20.6	− 4.4	0.3
Disposable income	100.0	80.6	24.3	− 5.2	.3
In NIPA's[3]:					
Personal income	100.0	84.3	20.2	− 4.8	.3
Disposable personal income	100.0	82.7	22.5	− 5.6	.4

[1]Personal income accrues to some organizations. They include nonprofit organizations, producer cooperatives, and mutual life insurance companies. [2]Personal nontaxes are nontax payments to public agencies, including tuition, room, and board at public universities and charges at public hospitals. These items are subtracted in NIPA's but not here. [3]NIPA's are the National Income and Product Accounts, measures computed by the U.S. Department of Commerce, Bureau of Economic Analysis.

Table 19—Personal income rearranged, 1964

Item	Total	Individuals (a + b + c)			Organizations[1]
		Cash received (a)	In-kind or imputed income (b)	Less depreciation (c)	
		Billion dollars			
Personal income paid out	520.1	474.9	64.8	− 21.3	1.7
Income excluded from personal income	21.5	12.1	9.4	0	0
Total income	541.6	487.8	74.2	− 21.3	1.7
Personal contributions for social insurance	− 12.6	− 12.6	0	0	0
Personal taxes	− 55.3	− 55.3	0	0	0
Personal nontaxes	[2]	[2]	[2]	[2]	[2]
Disposable income	473.7	419.1	74.2	− 21.3	1.7
		Percent			
Total income	100.0	89.9	13.7	− 3.9	0.3
Disposable income	100.0	88.5	15.7	− 4.5	.3

[1]Personal income accrues to some organizations. They include nonprofit organizations, producer cooperatives, and mutual life insurance companies. [2]Personal nontaxes are nontax payments to public agencies, including tuition, room, and board at public universities and charges at public hospitals. These items are subtracted in NIPA's but not here.

ually spent to obtain consumer goods and services, to acquire assets such as housing, and to pay interest.

Analysts, in trying to approximate these concepts, can construct a cash account for consumers from the components of the NIPA's with added information from the Federal Reserve Board's flow of funds accounts. Constructing a cash account for consumers involves:

- Omitting all in-kind or imputed income and expenditures including food stamps and food bought with stamps.

- Treating home ownership as an economic activity of households and not as a separate economic enterprise. The expenses of home maintenance, interest, and taxes are expenditures for owner-occupied housing.

- Using measures of expenditures for off-premise food and alcoholic beverages from total expenditures (ERS) rather than from personal consumption expenditures (BEA).

- Excluding nonprofit organizations when possible.

- Omitting depreciation (capital consumption allowances and adjustments).

- Reflecting changes in financial assets and liabilities, including new consumer loans, mortgages, and payments on existing loans.

The proposed cash account and personal income are compared in tables 21 and 22. Few line-by-line comparisons are possible, because items have been rearranged and the concepts are different. But the overall effect is certainly different. The cash account ends with a large, unexplained residual.

Table 20—Taxable U.S. income, 1964 and 1984

Item	1964	1984
	Billion dollars	
Total income[1]	541.6	3,367.4
Adjusted gross income:		
Taxable (BEA) [2]	442.0	2,424.9
Taxed (IRS) [2]	396.7	2,139.9
	Percentage of total income	
Taxable	81.6	72.0
Taxed	73.2	63.5

[1]Refer to tables 18 and 19. [2]The *National Income and Product Accounts of the United States, 1929-82*, table 8.14, and *Survey of Current Business*, May 1987, p. 19.

Advertising and Promotion

The effects of advertising and promotion on demand are widely debated. Perhaps some of the heat in debates over advertising effects is due to the uncertainty of results created by imperfect data.

A distinction between brand and generic advertising is often made along these lines: Most of the effects of brand advertising show up in shifting market share among brands, while most of the effect of generic advertising is on the level of demand for the products. This generalization is not completely true, but it may mean that brand and generic advertising should be treated differently.

The principal data problem arises because the only clearly defined expense category is media advertising. But media advertising accounts for less than half of what *Advertising Age* magazine considers to be advertising for food and beverage products. And many forms of promotion are not included. The relative importance of media advertising compared with other kinds of advertising and promotional efforts apparently varies from year to year. Coupons seem to vary fairly sharply, for instance. Coupons in advertisements are included in advertising costs, but the cost of redemption is usually not included. Coupons on the product

Table 21—Cash account for families and individuals, 1984

Item	Amount
	Billion dollars
Money income	3,527.3
Withheld	−498.5
Received	3,028.8
Increase in financial liabilities	+236.3
Cash available	3,265.1
Cash disbursements:	
Consumption items	2,073.1
Interest (except mortgages)	72.3
Taxes (except withholding)	40.0
Fines and nontaxes	12.2
Personal transfer payments to foreigners[1]	1.5
Total	2,199.1
Gross purchases of physical assets	498.8
Increase in financial assets	429.8
Unaccounted for	136.8

[1]Gifts and payments by U.S. individuals to foreign individuals.

Sources: All of the components except changes in assets and liabilities are from the NIPA's. Assets and liabilities include households, personal trusts, and nonprofit organizations. Financial assets exclude life insurance reserves, pension fund reserves, equity in noncorporate business (farm and nonfarm), and the change in value of stocks owned at the first of the year.

package are usually not included in advertising, being considered promotion.

No measures of the quantity of advertising are available. Data are solely for expenditures. Leading National Advertisers (LNA) provides expenditure data by company for detailed products. Major generic advertisers also provide information on their expenditures. Expenditure data typically are deflated by an index or indexes of advertising cost rates. But such an index has all the problems of any other price index used as a deflator: If it is a true price index, it is a poor deflator.

If quantity could be measured accurately, the problem of quality would still remain. The implicit assumption that all advertising dollars (deflated dollars) are equal is far from representing the facts, as every advertising executive and television viewer can attest. Thus, the unsatisfactory state of data on advertising and promotion makes incorporating data on brand advertising into demand analysis problematical at best.

An Example: Chicken

A case study of chicken provides an example of many of the choices that the analyst faces. The analyst must consider price, quantity, product form, and other factors.[8] For example, does the analyst:

• Include only young chicken or also mature chicken?

_____

[8] For another analysis dealing with these problems, see Eales and Unnevehr, 1988, which came to my attention after this report was prepared.

• Include whole, cutup, and further processed chicken or only some portion?

• Use retail or wholesale prices?

I constructed time series from 1962 to 1987 that illustrate many of the choices that must be made. The time series data on quantities come from records of Federal inspection of poultry slaughter and processing and estimates of slaughter under State inspection. Estimates are available of total pounds of ready-to-cook (RTC) mature and young chicken and of quantities of cutup and further processed poultry (including a statistic for miscellaneous poultry parts that are used in further processing). I assumed that 83 percent of the latter amount was young chicken and that 17 percent was turkey. Whole chicken is the residual.

The quantity figures are for domestic disappearance of commercially slaughtered chicken, which is calculated as:

Production
- Use in comminuted products (soup, pot pies, and so forth)
+/- Change in stocks
- Exports and shipments to territories
= Domestic disappearance

Whole, cutup, and further processed are defined by USDA's Food Safety and Inspection Service (FSIS) in the following way:

• Cutup is any bird which has been cut into parts, including those which are then packaged (often

Table 22—Personal income and its disposition in the National Income and Products Accounts (NIPA's), 1984

Item	Amount
	Billion dollars
Personal income:	
Received	3,243.7
Personal contributions for social insurance	– 133.5
	3,110.2
Personal tax and nontax payments	– 439.6
Disposable personal income	2,670.6
Personal outlays:	
Personal consumption expenditures	2,428.2
Interest paid by consumers to business	72.3
Personal transfer payments to foreigners (net)[1]	1.5
Personal savings	168.7

[1] Gifts and payments by U.S. individuals to foreign individuals.

without the neck and sometimes without the giblets).

- Further processed is any bird or part which receives treatment other than being cut up. It includes whole birds which are basted, smoked, barbecued, or cooked. It also includes the chicken nuggets sold by many fast food chains.

- Whole is the residual which did not receive any of the above treatments.

Doublecounting of further processed items at more than one stage creates a problem. For example, quantities of further processed poultry are sums of all use, with each conversion counted. I can treat the further processing of unidentified poultry by the above assumption, but other treatments result in doublecounting. I tried to calculate a similar series for turkey, in which the doublecounting problem is most severe, and the results were unacceptable. The statistic for disappearance of whole turkey, whose production is a residual, was very small in all recent years and even negative in one.

The series for chicken resulting from these assumptions appear plausible. Mature chicken, which are spent layers and an occasional rooster from breeding flocks, constitute a small proportion of total chicken. I assumed that all cutup and further processed mature chicken was used in soup and other comminuted products. The residual, whole mature chicken, remained positive though small, conforming to my expectations.

Young chicken consists mostly of broilers but also includes roasters. The statistic for quantity of roasters is available only from the Census of Manufactures every 5 years. I estimated quantity for other years, but it is small and has little overall effect on prices. The

doublecounting problem did not appear to be serious in the case of young chicken. The National Broiler Council surveys processors and distributors every few years. Its survey results present statistics of production of cutup and further processed chicken, including volume by both distributors and further processors. The survey has a high response, 87 percent of production in 1985. A comparison of my estimates with theirs yields comparable results (table 23).

Prices for whole chicken and parts, mostly for deliveries to first receivers, were obtained from market news. Parts prices are weighted by carcass proportions, which means that they probably misstate average prices slightly but mostly on low-valued parts like necks, backs, and giblets. Prices of further processed products, such as chicken hot dogs and luncheon meat, were estimated using fragmentary information.

Figures 4 and 5 show the resulting time series with comparisons. Wholesale prices of whole broilers rose 67 percent over the period and prices of cutup broilers rose 63 percent. But prices of young chicken in all forms rose 134 percent because of major shifts to higher priced forms.[9]

Retail prices rose more than wholesale prices because margins also rose (see fig. 5). But the spliced series for parts (chicken breasts for 1964-77 and all parts for 1978-87) rose substantially more than for whole birds, in contrast to the behavior of wholesale prices.

As figure 6 shows, the total quantity series (denoted as "all chicken") behaves much like the standard series on per capita consumption of chicken. This similarity is expected because the differences between the series are minor. But the shift from whole birds to cutup and further processed means that the components have very different movements (fig. 7). Per capita disappearance of whole birds declined 41 percent from 1962 to 1987, while that of cutup increased 1,090 percent. These very different movements cause the shifts in weights that create the price picture in figure 4.

These quantity series are calculated at the processing plant. There are no retail series for whole, cutup, and further processed chicken. Cutup includes complete cutup birds sold in retail stores (that is, all the parts except necks and giblets contained in a tray pack) and store sales of individual parts and assortments of parts not in carcass proportions. It also includes substantial and growing sales of chicken parts to food service outlets, particularly fast food fried chicken establishments.

Table 23—Young chicken by form, 1985

Form	Manchester calculation[1]	National Broiler Council survey[2]
	Percent	
Whole	31.0	29.6
Cutup	52.1	49.2
Further processed	16.9	18.2
Other	0	3.0

[1]Production (inspection data) less estimated use in comminuted products.

[2]Includes cutup and further processed young chicken broken out by distributors and further processors. National Broiler Council survey (*Broiler Industry*, October 1986, pp. 38-44, 97-100). Roasters and capons are estimated and are assumed to be whole birds.

[9] See appendix table 4 for the all-chicken series.

Figure 4
Wholesale prices of chicken by various measures, 1962-87

Percent of 1962
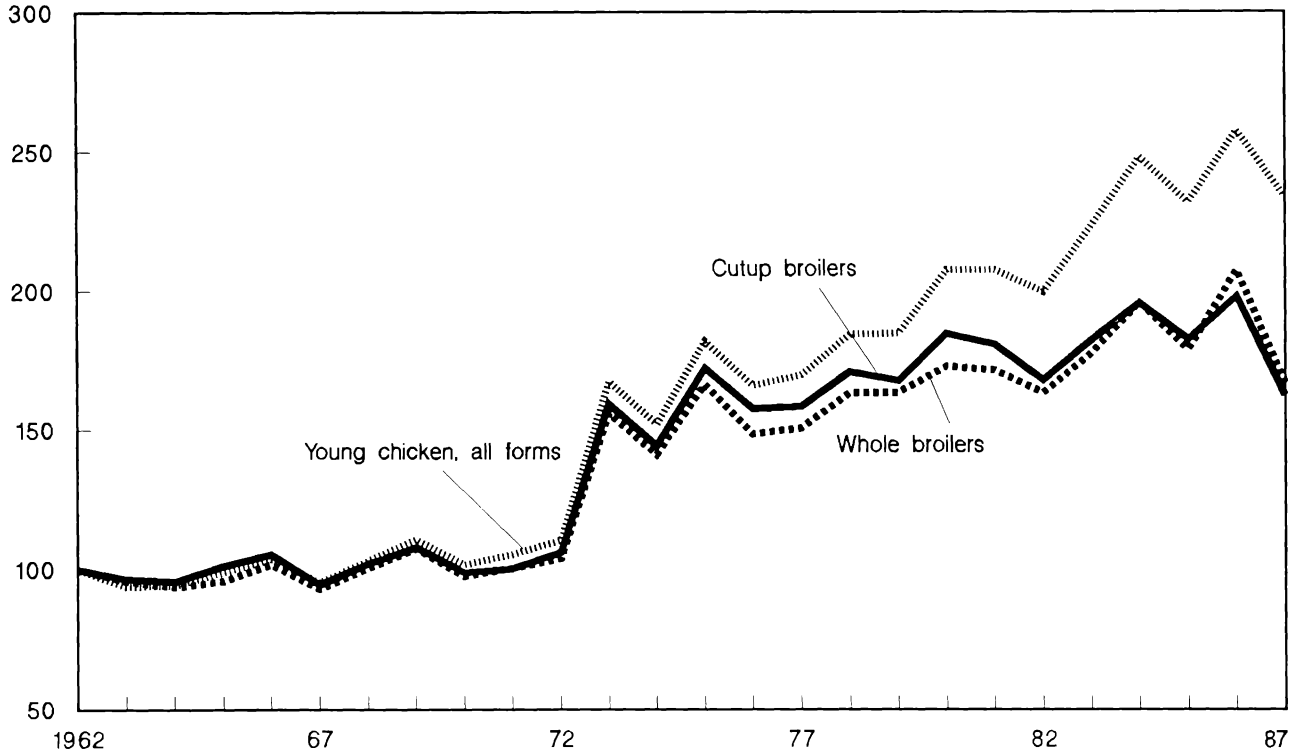
Source: Appendix table 4.

Figure 5
Retail prices of chicken, 1962-87

Percent of 1962

Source: Appendix table 4.

29
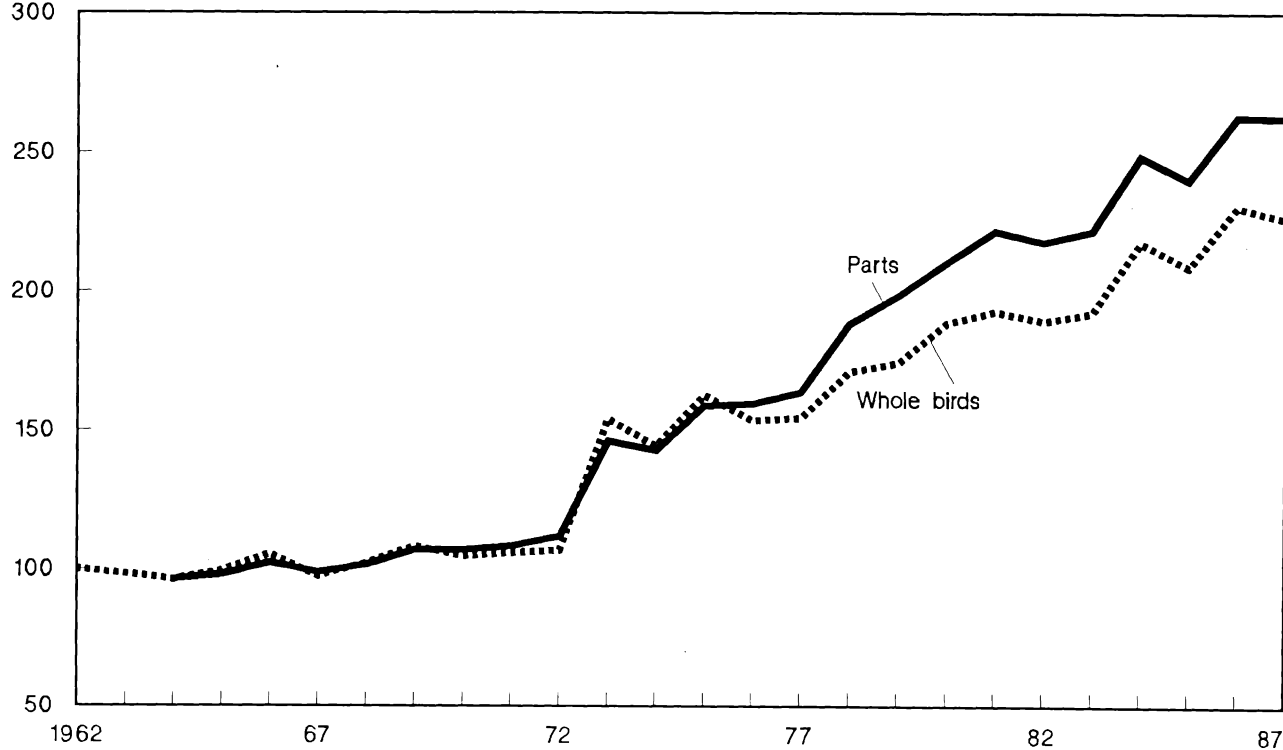
Figure 6
Per capita consumption of chicken, 1962-87
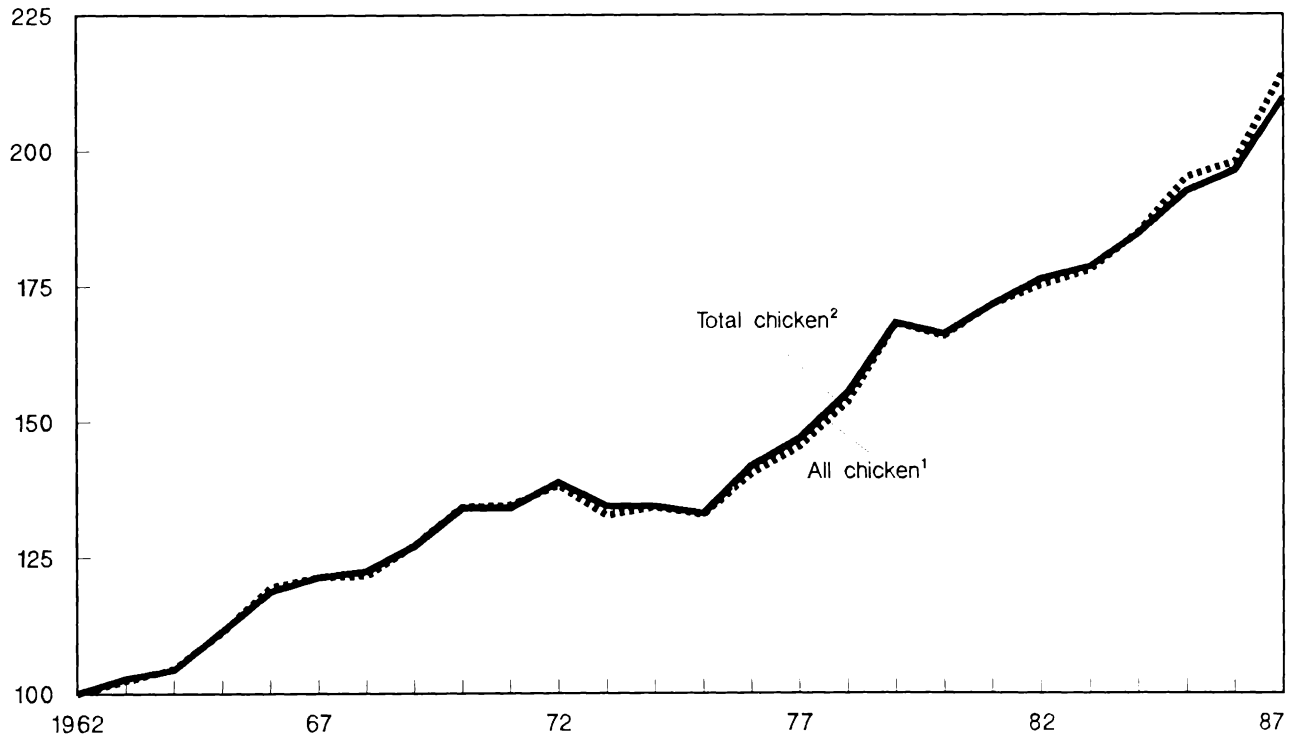
Percent of 1962

1/ Excludes home consumption where produced and use of further processed chicken in comminuted products.

2/ Includes products excluded in 1/.   Source: Appendix table 5.

Figure 7
Per capita consumption of young chicken by form, 1962-87

Percent of 1962
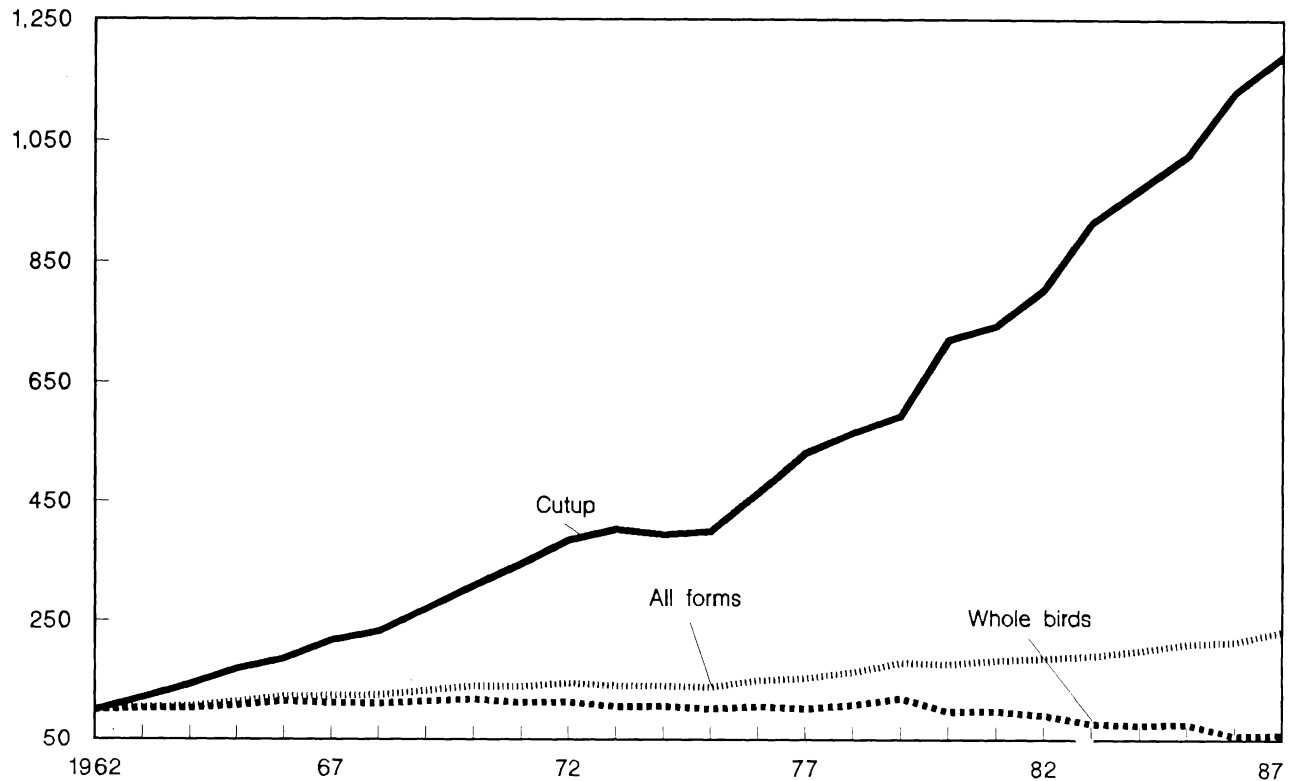
In a simple analysis using nominal prices, nominal incomes, and per capita consumption of all chicken, the different price series gave these results:

Price series	Own-price elasticity	Income elasticity
Retail prices of whole birds	-0.32	+0.49
Wholesale prices of whole birds	-.26	+.44
Wholesale prices of all chicken	-.27	+.48

References

Adams, Catherine F. (1975) *Nutritive Value of American Foods in Common Units,* U.S. Dept. Agr., Agr. Res. Serv., AH-456.

Archibald, Robert B. (1977) "On the Theory of Industrial Price Measurement: Output Price Indexes," *Annals of Social and Economic Measurement,* 6:57-72.

Branson, Robert E., and others (1987) "Data Sources for Demand Analysis," in Rauniker and Huang, eds. *Food Demand Analysis: Problems, Issues, and Empirical Evidence,* Iowa State Univ. Press, pp. 33-53.

Burk, Marguerite C., and Eleanor M. Pao (1976) *Methodology for Large-Scale Surveys of Household and Individual Diets,* U.S. Dept. Agr., Agr. Res. Serv., Home Econ. Res. Rpt. 40.

Capps, Oral, Jr., and Joseph Havlicek, Jr. (1987) "Concepts of Consumer Demand Theory," in Rauniker and Huang, eds. *Food Demand Analysis: Problems, Issues, and Empirical Evidence,* Iowa State Univ. Press, pp. 3-32.

Connor, John M. (1982) *Estimates of Manufacturers' Food and Beverage Shipments Among Major Marketing Channels, 1977,* U.S. Dept. Agr., Econ. Res. Serv., Staff Report No. AGES820416, April.

Crawford, Terry, and others (1988) *Issues and Options Related to the Reporting and Analysis of Retail Prices and Price Spreads for Beef,* U.S. Dept. Agr., Econ. Res. Serv., Staff Report No. AGES871102.

Drucker, Peter F. (1988) "The Coming of the New Organization," *The Harvard Business Review,* January-February, pp. 45-53.

Duewer, Lawrence A. (1988) "Introducing the All Fresh Beef Retail Price," *Livestock and Poultry Situation and Outlook Report,* U.S. Dept. Agr., Econ. Res. Serv., LPS-28, February.

Eales, James S., and Laurian J. Unnevehr (1988) "Demand for Beef and Chicken Products: Separability and Structural Change," *American Journal of Agricultural Economics,* 70:521-32, August.

Fox, Karl A. (1968) *Intermediate Economic Statistics,* New York: John Wiley and Sons.

Gieseman, Raymond (1987) "The Consumer Expenditure Survey: Quality Control by Comparative Analysis," *Monthly Labor Review,* March, pp. 8-14.

Levine, Daniel B., and Herman P. Miller (1957) *Response Variation Encountered with Different Questionnaire Forms: An Experimental Study of Selected Techniques Used in Agricultural Marketing Research,* U.S. Dept. Agr., Agr. Mktg. Serv., Mktg. Res. Rpt. 163, April.

Manchester, Alden C. (1983) *The Public Role in the Dairy Economy,* Boulder, CO: Westview Press.

_____(1987) *Developing an Integrated Information System for the Food Sector,* U.S. Dept. Agr., Econ. Res. Serv., Agr. Econ. Rpt. No. 575, August.

Nelson, Glenn L. (1974) *Food and Agricultural Policy in 1971-1974: Reflections on Controls and Their Impact,* report for U.S. Dept. Treasury, Off. Econ. Stabiliz., December.

Pao, Eleanor M., and Katherine E. Sykes (forthcoming) *USDA Methodological Research for Large-Scale Dietary Intake Surveys, 1975-1988,* U.S. Dept. Agr., Human Nutrit. Info. Serv., Home Econ. Res. Rpt. No. 49.

Pearl, Robert B. (1978) *1972-73 U.S. Consumer Expenditure Survey. A Preliminary Evaluation,* U.S. Dept. Commerce, Bur. of the Census, Tech. Paper No. 45, October.

_____(1979) *Reevaluation of the 1972-73 U.S. Consumer Expenditure Survey, A Further Examination Based on Revised Estimates of Personal Consumption Expenditures,* U.S. Dept. Commerce, Bur. of the Census, Tech. Paper No. 46, July.

Rauniker, Robert, and Chung-Liang Huang, eds. (1987) *Food Demand Analysis: Problems, Issues, and Empirical Evidence,* Iowa State Univ. Press.

Response Analysis (1976) *Household Food Use and Individual Intake: A Methodological Study.* Conducted for U.S. Dept. Agr., Consumer and Food Econ. Instit.

Rogers, George B. (1972) *Price Control Programs, 1917-71: Origins, Techniques, Effects on Food Prices,* U.S. Dept. Agr., Econ. Res. Serv., Agr. Econ. Rpt. No. 223, April.

Salathe, Larry E., and Rueben C. Buse (1979) *Household Food Consumption Patterns in the United States,* U.S. Dept. Agr., Econ., Stat., and Coop. Serv., Tech. Bull. No. 1587, January.

Schrimper, Ronald A. (1975) "Effects of Reduced Birth Rates on Milk Consumption," paper presented at meeting of American Agricultural Economics Association, August.

Sudman, Seymour, and Robert Ferber (1971) "Experiments in Obtaining Consumer Expenditures by Diary Methods," *Journal of the American Statistical Association,* 66:725-35, December.

_____and_____ (1974) "A Comparison of Alternative Procedures for Collecting Consumer Expenditure Data for Frequently Purchased Products," *Journal of Marketing Research,* XI:128-35, May.

U.S. Department of Agriculture, Food and Nutrition Service (1986) *An Analysis of Displacement Caused by Donations Through the Temporary Emergency Food Assistance Program (TEFAP),* July (also 1987).

U.S. Department of Labor, Bureau of Labor Statistics (1983) *Consumer Expenditure Survey: Diary Survey, 1980-81,* Bul. 2173.

_____ (1978) *Consumer Expenditure Survey: Integrated Diary and Interview Survey Data, 1972-73,* Bul. 1992.

_____ (1985) *Consumer Expenditure Survey: Interview Survey, 1980-81,* Bul. 2225.

Van Dress, Michael G. (1971). *The Foodservice Industry: Type, Quantity, and Value of Foods Used,* U.S. Dept. Agr., Econ. Res. Serv., Stat. Bul. No. 476.

_____ (1982) *The Foodservice Industry: Structure, Organization, and Use of Food, Equipment, and Supplies,* U.S. Dept. Agr., Econ. Res. Serv., Stat. Bul. No. 690.

Appendix table 1—Milk price indexes

Year	Whole milk (BLS)[1]		Store and home[2]	
	Store bought	Home delivered	Whole milk	Whole, lowfat, and skim milk
			1954 = 100	.
1954	100.0	100.0	100.0	100.0
1955	100.2	100.6	100.9	100.8
1956	103.3	104.6	103.2	103.1
1957	106.9	107.9	106.2	106.0
1958	108.9	109.9	108.1	107.7
1959	110.0	110.4	108.4	108.2
1960	112.6	113.3	109.8	109.4
1961	113.0	114.8	109.6	108.9
1962	112.4	114.6	109.4	108.4
1963	111.9	114.4	108.7	107.5
1964	112.2	116.1	108.4	107.3
1965	111.6	116.6	108.3	107.1
1966	118.8	122.8	113.2	111.8
1967	123.6	128.9	117.0	115.6
1968	128.7	135.3	121.2	119.7
1969	132.3	140.5	124.1	122.8
1970	137.9	147.3	129.0	126.8
1971	141.7	151.5	131.5	129.9
1972	143.8	155.0	132.6	130.9
1973	157.4	168.4	144.2	142.2
1974	188.5	*	172.3	170.2
1975	188.8	*	172.0	170.4
1976	198.6	*	181.1	179.1
1977	200.6	*	183.3	181.6
1978	212.2	*	193.6	191.4
1979	236.7	*	216.0	212.8
1980	257.6	*	231.5	227.2
1981	272.2	*	246.4	241.0
1982	273.7	*	247.4	241.0
1983	275.5	*	248.7	242.9
1984	277.6	*	250.2	243.9
1985	282.0	*	253.8	248.2
1986	280.3	*	252.2	246.6
1987	285.7	*	257.0	251.8

* = Not reported.

[1]Quarts 1954-63; half gallons 1964-77; all containers 1978-87.
Source: U.S. Department of Labor, Bureau of Labor Statistics.

[2]Average price, all containers, store bought and home delivered. Source: This study.

Appendix table 2—Retail beef prices and quantities

Year	Prices			Quantities	
	Beef and veal[1]	Choice beef[2]	All beef[3]	Fed beef	Commercial beef[4]
			1960 = 100		
1960	100.0	100.0	100.0	100.0	100.0
1961	98.4	97.8	98.9	105.4	102.7
1962	102.0	101.8	102.2	106.5	103.2
1963	100.8	97.9	100.3	117.2	110.0
1964	97.8	95.5	98.0	125.1	116.7
1965	102.5	99.9	101.8	123.7	116.7
1966	107.9	102.7	106.7	135.9	123.4
1967	108.6	102.9	107.9	143.5	126.3
1968	113.0	107.9	113.5	148.6	129.6
1969	124.3	120.0	126.3	157.3	130.6
1970	129.8	123.7	131.9	164.4	133.4
1971	135.6	131.5	139.4	161.9	132.3
1972	148.3	144.4	152.7	169.2	135.2
1973	177.9	172.9	180.1	160.5	127.1
1974	183.0	178.0	178.0	149.2	134.4
1975	184.6	188.3	177.3	127.1	138.4
1976	178.6	180.3	178.8	148.9	148.4
1977	177.6	180.5	183.4	150.8	143.9
1978	218.2	221.3	232.7	156.2	135.8
1979	277.7	275.3	297.4	149.4	123.1
1980	293.5	289.1	315.7	144.6	120.7
1981	296.0	290.4	322.5	142.4	121.7
1982	300.2	295.0	333.1	145.5	121.5
1983	295.7	289.7	328.4	150.3	123.7
1984	299.2	291.5	330.0	148.9	123.4
1985	292.8	283.0	323.0	155.1	124.5
1986	294.7	280.7	321.3	151.4	124.0
1987	317.0	295.0	—	146.6	116.1

— = Not available. [1]Veal accounted for 6.6 percent of beef and veal in 1967. Source: U.S. Department of Labor, Bureau of Labor Statistics. [2]Choice beef cuts weighted in carcass proportions. Source: U.S. Department of Agriculture, Economic Research Service. [3]All beef including estimated use in luncheon meats, canned specialties (soup, baby food, and others), and frozen specialties (dinners, entrees, pizza, and other). Source: This study. [4]Excludes farm slaughter.

Appendix table 3—Food prices as gauged by eight measures

Year	BLS indexes[1]			GNP deflator[2]			Link-and-chain index for food at home	Implicit deflator from food expenditures for all food
	All food	Food at home	Food away from home	All food	Food at home	Food away from home		
1977 = 100								
1960	45.8	47.1	40.6	46.7	48.4	41.1	45.9	43.8
1961	46.4	47.5	41.5	47.2	48.8	41.9	45.9	43.7
1962	46.8	47.8	42.6	47.7	49.2	43.1	46.3	43.8
1963	47.5	48.5	43.6	48.4	49.8	44.1	46.8	44.5
1964	48.1	49.0	44.4	49.3	50.7	44.8	47.5	45.2
1965	49.1	50.2	45.4	50.5	51.9	45.9	48.7	46.4
1966	51.6	52.7	47.5	53.1	54.7	48.0	50.7	48.2
1967	52.0	52.6	49.9	53.5	54.4	50.5	50.7	47.7
1968	53.9	54.3	52.5	55.5	56.4	53.1	52.7	50.2
1969	56.7	56.9	55.7	58.5	59.1	56.3	55.5	52.8
1970	59.8	59.8	59.9	61.8	62.3	60.5	58.3	55.4
1971	61.6	61.2	63.0	63.4	63.4	63.6	60.0	58.9
1972	64.3	63.9	65.5	66.8	67.0	66.3	62.9	61.7
1973	73.6	74.3	70.6	76.4	76.7	71.9	72.7	71.4
1974	84.1	85.4	79.6	86.9	89.1	80.7	84.8	84.0
1975	91.3	92.4	87.0	93.0	95.0	87.8	93.8	93.9
1976	94.1	94.4	92.9	95.6	96.2	93.6	94.8	94.9
1977	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1978	110.0	110.5	109.0	110.1	110.8	108.4	110.4	110.3
1979	122.0	122.5	121.3	121.6	121.9	120.4	121.7	121.5
1980	132.5	132.2	133.3	131.3	130.8	132.4	131.5	131.1
1981	142.9	141.9	145.3	142.7	142.0	144.2	139.9	136.2
1982	148.6	146.8	153.0	148.6	147.3	152.0	143.1	142.5
1983	151.8	148.4	159.7	150.9	147.9	158.7	144.1	143.3
1984	157.6	153.8	166.5	159.5	155.8	165.3	149.6	149.0

[1]BLS = Bureau of Labor Statistics, U.S. Department of Labor.

[2]GNP = gross national product.

Appendix table 4—Chicken prices

Year	Wholesale				Retail	
	Broilers		Young chicken all forms[3]	All chicken[3]	Whole birds[4]	Parts[5]
	Whole birds[1]	Cutup[2]				
	1962 = 100					
1962	100.0	100.0	100.0	100.0	100.0	—
1963	95.8	96.6	93.9	94.2	98.4	—
1964	93.7	95.7	94.2	94.6	96.3	96.3
1965	95.8	101.1	99.0	99.3	99.5	98.1
1966	101.8	105.4	103.7	103.7	105.4	102.3
1967	93.0	94.5	95.3	95.3	97.5	98.9
1968	100.4	102.0	103.1	103.1	102.2	101.7
1969	107.4	107.9	110.8	110.8	108.2	106.9
1970	97.5	98.9	101.7	101.7	104.7	106.9
1971	100.4	100.2	105.4	105.1	105.8	108.3
1972	103.9	106.1	110.5	110.8	106.8	111.8
1973	156.0	159.5	167.5	167.5	154.1	146.1
1974	141.2	144.4	152.2	151.5	144.4	142.9
1975	166.5	172.3	182.0	181.0	162.8	158.9
1976	148.6	157.7	166.1	165.8	153.6	159.7
1977	150.7	158.5	169.8	169.2	154.5	163.9
1978	163.4	170.9	184.4	184.4	171.2	188.3
1979	163.4	167.8	184.7	184.4	174.4	198.4
1980	172.9	184.7	207.5	206.8	188.7	210.5
1981	171.5	180.7	207.5	206.4	192.9	221.9
1982	163.4	168.0	199.7	199.0	189.4	217.8
1983	177.5	182.3	223.4	223.1	192.4	221.8
1984	195.8	195.5	248.1	248.1	217.8	248.7
1985	178.9	182.5	231.9	231.5	208.9	240.0
1986	207.4	198.0	257.6	257.6	230.6	262.9
1987	166.9	162.5	233.9	233.9	226.4	262.5

— = Not available. [1]Prices to first receivers; 1962-63 prices were estimated from prices to retailers; 1964-77 prices were reported from 9 cities and adjusted to 12-city level; 1978-87 prices were reported from 12 cities. [2]Prices to first receivers, New York City, excluding giblets. [3]Weighted average, current year weights. Includes roasters and capons. [4]Frying chicken, 1962-77. Fresh whole chicken, 1978-87. [5]Chicken breasts, 1964-77; fresh and frozen chicken parts, 1978-87.

Source: Calculated from data in *Poultry and Egg Statistics, 1960-85*, U.S. Dept. Agr., Econ. Res. Serv., Stat. Bul. 747, Dec. 1986, and from data obtained from U.S. Department of Labor, Bureau of Labor Statistics.

Appendix table 5—Per capita domestic disappearance of commercial chicken

Year	Young chicken			All chicken[2]	Total chicken[3]
	Whole birds	Cutup[1]	All forms[1]		
			1962 = 100		
1962	100.0	100.0	100.0	100.0	100.0
1963	102.6	120.6	104.2	102.3	102.7
1964	102.7	142.4	105.9	104.5	104.3
1965	107.3	169.5	113.7	111.2	111.4
1966	114.7	186.3	122.5	119.5	118.7
1967	111.5	216.8	123.4	121.4	121.4
1968	110.5	231.3	124.4	121.6	122.4
1969	114.1	268.7	131.7	127.2	127.1
1970	117.5	306.9	139.3	134.3	134.1
1971	111.7	343.9	138.6	134.6	134.1
1972	112.8	383.6	144.3	138.2	138.8
1973	105.3	402.3	139.8	132.7	134.4
1974	105.6	393.5	139.5	134.2	134.4
1975	101.5	398.5	137.3	132.8	133.1
1976	105.3	463.7	148.8	140.4	141.8
1977	101.8	532.1	152.8	145.3	146.8
1978	107.8	565.3	162.8	153.5	155.2
1979	119.3	593.1	178.6	168.1	168.2
1980	96.9	720.2	176.2	165.8	166.2
1981	97.5	743.1	182.2	171.6	171.6
1982	90.6	803.8	185.8	175.1	176.3
1983	77.0	914.9	189.9	177.9	178.6
1984	74.1	970.6	198.6	184.9	184.6
1985	75.8	1,026.7	209.8	195.1	192.6
1986	56.7	1,131.7	213.3	197.9	196.3
1987	58.5	1,190.5	231.1	214.4	209.7

[1]Includes cutup birds sold as a unit (for example, tray packed).

[2]Excludes home consumption where produced and use of further processed chicken in comminuted products.

[3]Includes products excluded in [2].

ERS-NASS VIDEO TAPES

ERS: Economic Research for American Agriculture

An historical account of the role of economic research in the success of American agriculture.

16 1/2 minutes.
Order No. VT001 $15.00

Today and Tomorrow

The U.S. Department of Agriculture's Outlook program analyzes the current situation for U.S. and world crops, and provides a forecast of future supplies and prices. "Today and Tomorrow" is an overview of the USDA Outlook program from its beginning in the 1920's, to the current comprehensive program of research and analysis.

23 minutes.
Order No. VT002 $15.00

The Need To Know

Begins with a futuristic "what if?" opening, and then proceeds to outline the history, significance, and contributions of agricultural statistics and USDA's National Agricultural Statistics Service.

23 minutes.
Order no. VT003 $15.00

Your Hometown

"Your Hometown" is an informative and entertaining look at small town rural America. Originally seen on public television stations nationwide, and narrated by James Whitmore, the program focuses on three rural communities where citizens use innovative thinking and teamwork to revitalize their own towns.

1 hour.
Order No. VT004 $15.00

Alternative Agriculture: Growing Concerns

Can U.S. farmers produce at a profit while practicing low-input, sustainable agriculture (LISA)? "Growing Concerns" investigates the benefits and drawbacks of LISA. An excellent overview, this documentary was originally seen as a five-part series on national television.

19 minutes.
Order No. VT005 $15.00

Ethanol: Economic and Policy Tradeoffs

Ethanol can contribute to the national goals of energy security, a clean environment, and a healthy rural economy, but there are tradeoffs.

25 minutes.
Order No. VT006 $15.00

To order, call toll free, 1-800-999-6779 (8:30-5:00 E.T. in the U.S. and Canada; other areas, please call 301-725-7937) or write: ERS-NASS, P.O. Box 1608 , Rockville, MD 20849-1608

Save by subscribing for up to 3 years!

Situation and Outlook Reports. These reports provide timely analyses and forecasts of all major agricultural commodities and related topics such as finance, farm inputs, land values, and world and regional developments.

	1 year	2 years	3 years
Agricultural Exports (4 per year)	_____ $12	_____ $23	_____ $33
Agricultural Income and Finance (4 per year)	_____ $12	_____ $23	_____ $33
Agricultural Resources (5 per year, each devoted to one topic, including *Inputs, Agricultural Land Values and Markets*, and *Cropland, Water, and Conservation*.)	_____ $12	_____ $23	_____ $33
Aquaculture (2 per year)	_____ $12	_____ $23	_____ $33
Cotton and Wool (4 per year)	_____ $12	_____ $23	_____ $33
Dairy (5 per year)	_____ $12	_____ $23	_____ $33
Feed (4 per year)	_____ $12	_____ $23	_____ $33
Fruit and Tree Nuts (4 per year)	_____ $12	_____ $23	_____ $33
Livestock and Poultry (6 per year plus 2 supplements)	_____ $17	_____ $33	_____ $48
Livestock and Poultry Update (monthly)	_____ $15	_____ $29	_____ $42
Oil Crops (4 per year)	_____ $12	_____ $23	_____ $33
Rice (3 per year)	_____ $12	_____ $23	_____ $33
Sugar and Sweetener (4 per year)	_____ $12	_____ $23	_____ $33
Tobacco (4 per year)	_____ $12	_____ $23	_____ $33
Vegetables and Specialties (3 per year)	_____ $12	_____ $23	_____ $33
U.S. Agricultural Trade Update (monthly)	_____ $15	_____ $29	_____ $42
Wheat (4 per year)	_____ $12	_____ $23	_____ $33
World Agriculture (4 per year)	_____ $12	_____ $23	_____ $33
World Agriculture Regionals (5 per year)	_____ $12	_____ $23	_____ $33

Supplement your subscription to *World Agriculture* by subscribing to these five annuals: *Western Europe, Pacific Rim, Developing Economies, China,* and *USSR.*

For *fastest* service, call toll free: 1-800-999-6779 (8:30-5:00 ET in the U.S. and Canada; other areas please call 301-725-7937)

- Use purchase orders, checks drawn on U.S. banks, cashier's checks, or international money orders.

- ***Make payable to ERS-NASS.***

- Add 25 percent for shipments to foreign addresses (includes Canada).

☐ Bill me.   ☐ Enclosed is $_____.

Credit Card Orders:

☐ MasterCard ☐ VISA   Total charges $ _____.

Name _____

Organization _____

Address _____

City, State, Zip _____

Daytime phone (_____)_____

Credit card number: [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]   Expiration date: **Month / Year** [ ][ ]

Complete both sides of this order form and mail to:
ERS-NASS
P.O. Box 1608
Rockville, MD 20849-1608

Get these timely reports from USDA's Economic Research Service

These periodicals bring you the latest information on food, the farm, and rural America to help you keep your expertise up-to-date. Order these periodicals to get the latest facts, figures, trends, and issues from ERS.

Agricultural Outlook. Presents USDA's farm income and food price forecasts. Emphasizes the short-term outlook, but also presents long-term analyses of issues ranging from international trade to U.S. land use and availability. Packed with more than 50 pages of charts, tables, and text that provide timely and useful information.

Economic Indicators of the Farm Sector. Updates economic trends in U.S. agriculture. Each issue explores a different aspect of income and expenses: national and State financial summaries, production and efficiency statistics, costs of production, and an annual overview.

Farmline. Concise, fact-filled articles focus on economic conditions facing farmers, how the agricultural environment is changing, and the causes and consequences of those changes for farm and rural people. Synthesizes farm economic information with charts and statistics.

Foreign Agricultural Trade of the United States. Every 2 months brings you quantity and value of U.S. farm exports and imports, plus price trends. Subscription includes two big 300-page supplements containing data for the previous fiscal or calendar year. A must for traders!

Journal of Agricultural Economics Research. Technical research in agricultural economics, including econometric models and statistics on methods employed and results of USDA economic research.

National Food Review. Offers the latest developments in food prices, product safety, nutrition programs, consumption patterns, and marketing.

Rural Development Perspectives. Crisp, nontechnical articles on the results of the most recent and the most relevant research on rural areas and small towns and what those results mean.

☐ Check here for a **free** subscription to *Reports*, a quarterly catalog describing the latest ERS research reports. It's designed to help you keep up-to-date in all areas related to food, the farm, the rural economy, foreign trade, and the environment.

See other side for other periodicals available from ERS!

	1 year	2 years	3 years
Agricultural Outlook (11 per year)	___ $26	___ $51	___ $75
Economic Indicators of the Farm Sector (6 per year)	___ $14	___ $27	___ $39
Farmline (11 per year)	___ $12	___ $23	___ $33
Foreign Agricultural Trade of the United States (8 per year)	___ $25	___ $49	___ $72
Journal of Agricultural Economics Research (4 per year)	___ $8	___ $15	___ $21
National Food Review (4 per year)	___ $11	___ $21	___ $30
Rural Development Perspectives (3 per year)	___ $9	___ $17	___ $24

Complete both sides of this order form.

Single copies of all periodicals available for $8.00 each.